UNITED STATES COAST PILOT

PACIFIC COAST

CALIFORNIA, OREGON, AND WASHINGTON

SIXTH (1942) EDITION

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JESSE H. JONES, Secretary

COAST AND GEODETIC SURVEY
LEO OTIS COLBERT, Director

Serial No. 649

UNITED STATES COAST PILOT

PACIFIC COAST

CALIFORNIA, OREGON, AND WASHINGTON

Sixth (1942) Edition

UNITED STATES
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Number in parenthesis immediately following any item in these Contents is number of the largest scale U. S. Coast and Geodetic Survey chart on which that feature appears.

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PREFACE

This volume is the sixth edition of the United States Coast Pilot covering the Pacific Coast of the United States which lies between the borders of Mexico and Canada, including off-lying islands, and descriptions of the rivers and inlets to the head of navigation. It is based on the work of the United States Coast and Geodetic Survey and includes the results of a special field examination made in 1941. The following system is used in this publication.

Chapter 1 gives information of a character adaptable to all Coast Pilots. It includes a description of the services rendered the mariner by various Government agencies, instructions in case of shipwreck, information on radio facilities and weather reports, certain facts regarding the use of charts, factors affecting the magnetic compass, and similar information.

Chapter 2 gives a general description of the area covered in the pilot and information of a local character, such as tides, offshore currents, weather conditions, coastwise navigation, and local services.

Chapter 3 describes the routes that are most commonly followed by vessels navigating in these waters. Sailing directions, listing courses and distances to be run, are given in tabular form.

Chapters 4 to 18, inclusive, furnish a description of the coast and detailed information of use to the mariner on each port and harbor in the area. This section of the book is correlated with the United States Coast and Geodetic Survey charts in the following manner:

A separate chapter is set apart for the description of the area covered by each of the general coast charts which are on a scale of approximately 1:200,000, except in Puget Sound, where charts on a scale of 1:80,000 have been used. The number of the general chart is entered at the top of each page of the Coast Pilot.

Each chapter is divided into sections according to the largest scale charts. Each section is given a title, which includes the limits of the area, and the number of the largest-scale Coast and Geodetic Survey chart on which that section is shown. The titles are printed as center headings at the beginning of the sections.

Each feature indexed is shown in bold-face type. The Index has been enlarged to include the number of the largest-scale Coast and Geodetic Survey chart on which each feature appears.

At frequent intervals throughout the text, at the bottom of the page, are given the latitude and longitude of some indicated feature named on that page, together with the numbers of all the Coast and Geodetic Survey charts on which that feature appears.

Chapter 19 (Appendix) gives general information of a local character in tabular. form, meteorological data, conversion tables and a table of distances between the principal ports of the area. This includes the addresses of the offices maintained by different bureaus of the Government to serve the mariner and lists of Coast Guard stations, yacht clubs, drydocks, and marine railways. There are also given meteor-

ological tables for various cities in the area, compass variations in various localities tables for the conversion of courses in points to degrees, tables for the conversion of feet and fathoms to meters, table of distances between the principal ports in this area addresses of harbormasters, and various other local information.

The aids to navigation mentioned in this pilot are those in existence on the date shown below. Correction of these aids, as well as to other information affecting the text in this Coast Pilot, are given in the Notice to Mariners as they occur.

Supplements to this Coast Pilot, giving the more important changes in the text, are issued from time to time as warranted by the number and importance of the corrections. Each supplement is accumulatively complete and cancels all previous issues. When using this Coast Pilot, reference should be made to the latest supplement and also to each Notice to Mariners issued subsequently. The supplement may be obtained free upon application to the United States Coast and Geodetic Survey.

LEO OTIS COLBERT, *Director.*

December 1, 1942.

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U. S. COAST AND GEODETIC SURVEY CHARTS

UNITED STATES COAST PILOT

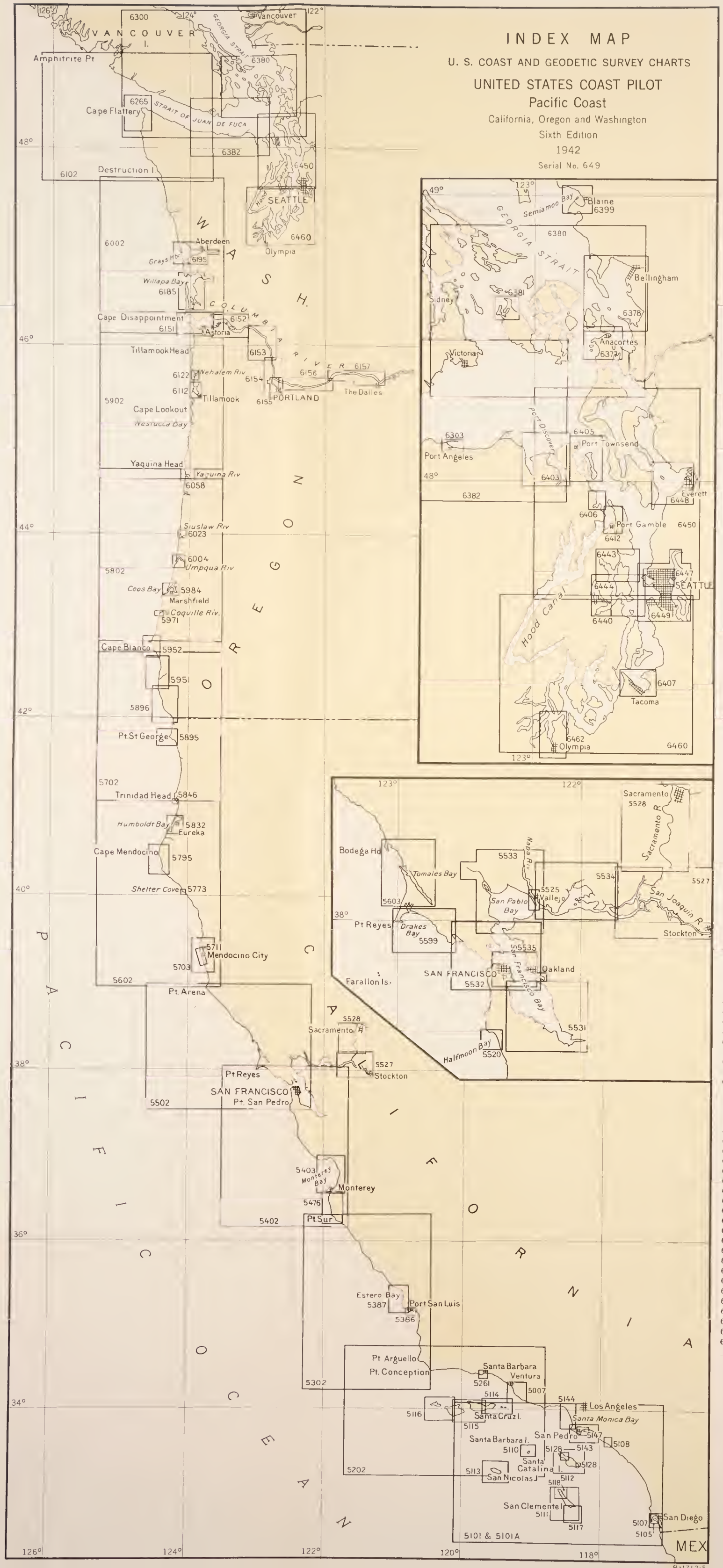
Pacific Coast

California, Oregon and Washington

Sixth Edition

1942

Serial No. 649



No.	Price	Approximate scale
5007	$0.25	1:40,000
		1:20,000
		1:10,000
5101	.75	1:235,100
5101A	.75	1:235,100
5105	.75	1:10,000
5107	.75	1:20,000
5108	.75	1:10,000
5110	.75	1:20,000
5111	.75	1:40,000
5112	.75	1:40,000
5113	.75	1:40,000
5114	.50	1:40,000
		1:20,000
5115	.75	1:40,000
5116	.75	1:40,000
		1:20,000
5117	.75	1:15,000
5118	.50	1:20,000
		1:5,000
5128	.25	1:10,000
5143	.50	1:40,000
5144	.50	1:40,000
5147	.75	1:12,000
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5528	.75	1:40,000
5531	.75	1:40,000
5532	.75	1:40,000
5533	.75	1:40,000
5534	.75	1:40,000
5535	.75	1:20,000
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5603	.75	1:30,000
5702	.75	1:197,000
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		1:10,000
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5773	.25	1:15,000
5795	.50	1:40,000
5802	.75	1:191,000
5832	.50	1:30,000
5846	.25	1:15,000
5895	.25	1:40,000
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5896	.75	1:40,000
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		1:10,000
5902	.75	1:185,000
5951	.75	1:40,000
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5971	.25	1:10,000
5984	.75	1:20,000
6002	.75	1:181,000
6004	.25	1:20,000
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6058	.50	1:20,000
6102	.75	1:176,000
6112	.50	1:20,000
6122	.25	1:20,000
6151	.75	1:40,000
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6300	.75	1:200,000
6303	.25	1:10,000
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6406	.25	1:10,000
6407	.50	1:15,000
6412	.25	1:20,000
6440	.25	1:10,000
6443	.50	1:20,000
6444	.75	1:20,000
6447	.75	1:10,000
6448	.25	1:40,000
6449	.75	1:25,000
6450	.75	1:80,000
6460	.75	1:80,000
6462	.50	1:20,000

IMPORTANT

Use of this Coast Pilot will be simplified by reading the preface, in which the divisions of the text and the methods of linking it with the charts are described in detail.

The courses and bearings are given in degrees, true, reading clockwise from 0° at north to 359°. In the case of lights all bearings are from seaward. When a course is given as "067°", it is meant that that is the true course to be made good.

Distances are in nautical miles. Multiply nautical miles by 1.15 to obtain the approximate statute miles.

The directions of winds are the points from which they blow; of currents, the points toward which they set. These directions are true.

Depths are in feet or fathoms below mean lower low water. Heights are in feet above high water.

Currents are expressed in knots, which are nautical miles per hour.

The addresses of various offices furnishing service to the mariner, located within the area covered by this Pilot, are tabulated in the appendix, together with other material of value.

To find Coast and Geodetic Survey chart numbers in this Coast Pilot:

A Graphic Chart Index is adjacent to this page.

In the text the names indexed are printed in bold-faced type and at the top of the chapter is given the number of the general coast chart on which the features appear. The numbers of the largest scale charts are shown under the center headings.

At frequent intervals a name is marked by an asterisk (*). The approximate latitude and longitude of the point so marked, together with the numbers of all the charts on which that point is shown, are given at the bottom of that page.

In the Index, under the listing "Chart numbers", the largest scale charts and general coast charts are listed by numbers with the pages on which each chart is described.

Light and fog signal characteristics are not fully described, and light sectors are not always defined. The mariner should consult the Light Lists, which are published at intervals of about a year.

Supplements containing corrections and additions are issued about once each year. The latest supplement to any volume, together with the Notice to Mariners for the current year, will correct that Coast Pilot to date.

CAUTION.—The text of this Coast Pilot describes the lights, landmarks, port facilities, etc., under peacetime operation and conditions may be considerably different. The entire coast is now under blackout.

UNITED STATES COAST PILOT

PACIFIC COAST

CALIFORNIA, OREGON, AND WASHINGTON

Chapter 1.—GOVERNMENT SERVICES TO THE NAVIGATOR

U. S. COAST AND GEODETIC SURVEY

The **Coast and Geodetic Survey** is charged with (1) the survey of the coasts of the United States and its possessions, to insure the safe navigation of coastal and intracoastal waters; (2) the determination of geographical positions and elevations along the coast and also in the interior of the country, to coordinate the coastal surveys and provide a framework for mapping and other engineering work; (3) the study of tides and currents to furnish datum planes to engineers and tide and current tables to mariners; (4) the compilation of aeronautical charts, to meet the needs of the pilots of aircraft; (5) observations of the earth's magnetism in all coastal waters and all parts of the country, to furnish magnetic information essential to the mariner, aviator, land surveyor, radio engineer, and others; and (6) seismological observations and investigations to supply data required in designing structures to reduce the earthquake hazard.

The results of these surveys and determinations are analyzed in the Washington office and published as **nautical** and **aeronautical charts;** annual tables of **predicted tides** and **currents; coast pilots;** charts showing **magnetic declination;** annual lists of United States earthquakes; abstracts of geographic positions and elevations; and other publications.

District Offices are located at some of the principal ports as listed in the Appendix. Files of charts, coast pilots, and other publications are maintained at these District Offices for the use of mariners, who are invited to avail themselves of the facilities afforded. Charts, coast pilots, current tables, and tide tables are kept for sale.

Reporting of dangers, shoals, changes in channel depths, etc.—Mariners are especially requested to immediately inform the Coast and Geodetic Survey of all important facts relating to changes in the coast pilots and charts that may come to their attention. Reports of an urgent character should be sent by radio or telegram.

The Coast and Geodetic Survey must depend in a great measure upon outside sources of information pending a complete revision of a coast pilot volume. Mariners and others will therefore realize the importance and great desirability of cooperation in this work and are urgently requested to forward to the Director, United States Coast and Geodetic Survey, Washington, D. C., directly or through a district office, any information affecting the coast pilots or charts that may come to their notice, as well as any suggestions that they may have for increasing the value of these publications.

Agencies for the sale of the Charts, Coast Pilots, Tide Tables, and Current Tables of the Coast and Geodetic Survey are established in many ports of the United States and in some foreign ports. The charts and publications can also be purchased at the office of the Coast and Geodetic Survey, Washington, D. C., or any of the District Offices. If ordered by mail, prepayment is obligatory. Remittances should be made by money order, express order, or check, payable to the U. S. Coast and Geodetic Survey. Postage stamps cannot be accepted. The sending of money is unsafe except by registered letter. Only the numbers of charts need be mentioned. The catalog of charts and other publications of the Survey may be obtained free of charge on application at any of the sales agencies or to the Coast and Geodetic Survey, Washington, D. C. A list of the sales agencies of the Coast and Geodetic Survey is in the catalog and is repeated quarterly in the Notice to Mariners.

The sales agents located within the area covered by this Coast Pilot are listed in the Appendix.

Special signals for surveying vessels.—The following signals have been prescribed for vessels of the United States engaged in hydrographic surveying:

By day a surveying vessel of the Coast and Geodetic Survey, under way and employed in hydrographic surveying, may carry in a vertical line, one over the other not less than 6 feet apart where they can best be seen, three shapes not less than 2 feet in diameter of which the highest and lowest shall be globular in shape and green in color and the middle one diamond in shape and white.

Vessels of the Coast and Geodetic Survey shall carry the above-described marks while actually engaged in hydrographic surveying and under way, including drag work. Launches and other boats shall carry the prescribed marks when necessary.

By night a surveying vessel of the Coast and Geodetic Survey, under way and employed in hydrographic surveying, shall carry the regular lights prescribed by *The Rules of the Road.*

A vessel of the Coast and Geodetic Survey, when at anchor in a fairway on surveying operations, shall display from the mast during the daytime two black balls in a vertical line and 6 feet apart. At night two red lights shall be displayed in the same manner. In the case of a small vessel the distance between the balls and between the lights may be reduced to 3 feet if necessary.

Such vessels, when at anchor in a fairway on surveying operations, shall have at hand and show if necessary in order to attract attention a flare-up light in addition to the lights which are, by this regulation, required to be carried.

In addition to the signals described, vessels of the U. S. Coast and Geodetic Survey when engaged in survey work often hoist one of the following International Code signals:

HD signifying "I am engaged in submarine work, you should keep clear of me."

HF signifying "I have a sweep out, you should keep clear of it."

ONA having the same meaning as the two letter hoist "HD."

The wire drags used by the Coast and Geodetic Survey in sweeping for dangers to navigation may be crossed by vessels without danger of fouling at any point except between the towing launches and the large buoys near them, where the towline approaches the surface of the water. Steamers passing over the drag are requested to change course so as to cross it approximately at right angles, as a diagonal course may cause the propeller to foul the supporting buoys and attached wires.

No attempt should be made to pass between the wire drag launches while the wire

is being set out or taken in, unless it would endanger a vessel to do otherwise. In setting out or taking up the wire drag, the tension on the bottom wire is released and the floats at each 100-foot section may cause the wire to be held near the surface. At the time the launches are usually headed either directly toward or away from each other and the operation of taking up or setting out may usually be clearly seen.

CHARTS

Accuracy of charts.—Each sounding represents an actual measure of depth and location at the time the survey was made. Shores and shoals where sand and mud prevail, and especially bar harbors and the entrances of bays and rivers exposed to strong tidal current and a heavy sea, are subject to continual change of a greater or less extent, and important ones may have taken place since the date of the last survey. In localities which are noted for frequent and radical changes, such as the entrances to a number of estuaries on the Atlantic, Gulf, and Pacific coasts, notes are printed on the charts calling attention to the fact.

It should also be remembered that in coral regions and where rocks and boulders abound it is always possible that a survey with lead and line, however detailed, may have failed to find every small obstruction. For these reasons, when navigating such waters, the customary sailing lines and channels should be followed and those areas avoided where the irregular and sudden changes in depth indicate conditions which are associated with pinnacle rocks, coral heads, or boulders.

Dredged channels.—These are generally shown upon the chart by two broken lines to represent the side limits of the improvement together with the depth and date. The depth is the controlling depth through the channel on the date charted and does not mean that this depth obtains over the full width of the channel, nor that the depth has not subsequently changed due to either shoaling or dredging. The coast pilot generally gives the project dimensions of an improved channel.

Buoys.—Too much reliance should not be placed on buoys always maintaining their exact station, especially when in exposed localities. It is safer, when possible, to navigate by bearings or angles referred to fixed objects on shore and by the use of soundings.

Plane of reference for soundings on charts.—For the Atlantic coast of the United States and Puerto Rico the plane of reference for soundings is the mean of all low waters; for the Pacific coast of the United States and Alaska, with the one exception noted below, and for the Hawaiian and Philippine Islands, it is the mean of the lower low waters. For the Atlantic coast of the Canal Zone, Panama, the plane of reference for soundings is mean low water, and for the Pacific coast of the same it is low-water springs. For foreign charts many different planes of reference are in use, but that most frequently adopted is low-water springs.

Nautical charts bear three dates, which are important to persons using them: (1) The **edition date** (month and year) of the publication note, *printed* on most charts, centrally in the lower margin; (2) the **print date** (year, month, and day), the latest date *printed* in the lower left-hand corner below the border, which is the date of correction to the printing plate; (3) the **date of issue,** *stamped* in the right lower margin and just to the left of the subtitle. Charts contain all necessary corrections for aids to navigation, dredged channels, and dangers, which have been received to the date of issue, being corrected by hand for data received after the latest print date.

Scales of charts.—The charts are various in character, and are constructed on different scales, to adapt them to varied navigational purposes. The most important distinctions are the following:

1. Sailing charts, on scales from 1:600,000 to 1:4,500,000 intended principally for navigating in offshore regions as in entering coastal regions or when proceeding between distant ports.

2. General charts of the coast, on scales from 1:180,000 to 1:400,000, intended especially for coastwise navigation, where a vessel's course is offshore but mostly within sight of land or aids to navigation.

3. Coast charts, on scales from 1:80,000 to 1:100,000, intended for coastwise navigation, close to shore; and for entering and navigating the larger bays and harbors.

4. Harbor charts, on scales from 1:5,000 to 1:40,000, intended for navigation of harbors and constricted waterways.

Caution in using small-scale charts.—It is obvious that dangers to navigation cannot be shown with the same amount of detail on small-scale charts as on those of larger scale; therefore, in approaching the land or dangerous banks, regard should be had to the scale of the chart, and the largest scale chart available should be used. A small error in laying down a position means only yards on a large-scale chart, whereas on a small scale the same amount of displacement means large fractions of a mile. For the same reason, bearings to near objects should be used in preference to objects farther off, although the latter may be more prominent, as a small error in bearing or in laying it down on the chart has greater effect in misplacing the position the longer the line to be drawn.

SOME FACTORS AFFECTING THE USE OF THE MAGNETIC COMPASS

Compass, change in the variation of.—The gradual increase or decrease of the variation must not be forgotten in laying down positions by bearings on charts. The magnetic compass roses placed on the charts to facilitate plotting become in time slightly in error as a result of this change, and in some cases, such as with small-scale charts or when the lines are long, the displacement of position from neglect of this change may be of importance. The compass roses are replotted for every new edition of the chart if the error is appreciable. Means for estimating the magnitude of this error are provided by stating for each compass rose the year for which it is constructed and the annual rate of change in the locality for that period.

From time to time there has been considerable uncertainty in the rates of change prevailing in various parts of the coastal waters of the United States and its possessions and dependencies. The sparsity of the older observations, coupled with the lack of a suitable nonmagnetic vessel and the virtual suspension of magnetic work in some regions, has introduced uncertainties in the values of variation as compared with those shown on the charts, amounting to perhaps as much as one degree for some of the outlying possessions.

The systematic differences in the magnetic variation encountered in going from place to place, i. e., the differences ascribed to the general pattern of the earth's magnetization, are quite pronounced along some parts of the coast line of the United States. Unless properly and continuously taken into account, these differences are apt to affect materially the course of a vessel. This is particularly so in New England and parts of Alaska, where the lines of equal magnetic variation are close together, denoting rapid changes in magnetic variation from place to place, as indicated by the large differences in variation given on neighboring compass roses.

On certain of the sailing and general charts the magnetic variation is shown by isogonic lines in addition to the compass roses. These lines depict the distribution of the magnetic variation over the entire navigable area of the chart.

Local magnetic disturbance.—The synonymous terms "local magnetic disturbance" and "local attraction" have reference only to the effects on the compass of magnetic masses external to the ship. They may be sufficient to cause noticeable deflections of the compass in passing over certain spots. Such disturbances are of fairly common occurrence in shallow waters; they are never encountered over oceanic depths. However, it must not be inferred from this that the source of a given disturbance noted on board ship is situated in the direction of the visible land. Rather is it to be expected that the magnetic masses responsible are distributed in the nearest solid matter, which is naturally (in most cases) the bed of the sea under the ship. In this connection it may be noted that the ordinary irregularities of the magnetic field in close proximity to the earth's crust are known to diminish rapidly with increasing distance from the disturbing matter, so that in the absence of positive evidence, it is not believed that such irregularities would noticeably affect a ship's compass where the depths are upwards of 500 fathoms.

Despite the common use of the term "magnetic attraction," the actual effect of a magnetic body may be to deflect the compass either toward or away from it, depending on how the body is magnetized and the vessel's position with respect to the body.

It is unlikely that all the areas of magnetic disturbance have been located. When such an area is discovered, the position should be fixed and the facts reported as far as they can be ascertained. It is particularly important to note the time at which the disturbance was encountered, so as to rule out the possibility that the effects were caused by a magnetic storm rather than by local irregularity.

Deviation.—The magnetic field of the earth is also modified by the presence of the ship itself. This effect combines with any instrumental error of the compass to cause the *deviation*, which is defined as the angle between magnetic north, as indicated by a given compass on a given heading of the ship, and the direction of magnetic north which would be observed at the same time and place with a compass free from error on a completely nonmagnetic vessel. It is denoted "easterly" or "westerly" according as the needle points east or west of the direction it would assume if the deviation were zero. The deviation varies with the heading of the ship and with the magnetic latitude. It is customary to counteract the deviation as far as is conveniently possible by soft iron and permanent magnets, suitably placed in or on the binnacle. See Special Publication No. 96 of the United States Coast and Geodetic Survey, entitled "*Instructions for Compensation of the Magnetic Compass.*"

Determination of Compass Error by the Use of Navigational Ranges.—The azimuths of channel ranges, which have been determined with sufficient accuracy for compass error determination, are indicated in degrees and minutes in the Light Lists and in the Notice to Mariners. Azimuths given only in degrees should not be used for this purpose.

TIDES AND CURRENTS

Tide Tables for the **Atlantic Ocean** and for the **Pacific Ocean** (two volumes) are published in advance annually by the United States Coast and Geodetic Survey, price 25 cents each. The first volume supplies full tidal data for the east coast of North and South America, the west and north coasts of Africa, and all of Europe. The Pacific Ocean Tide Table gives data for the Pacific and Indian Oceans.

They contain tables of full daily predictions of the times and heights of high and low waters for certain reference stations along the coasts, with full explanations for the use of this table. The use of Table 2 of the Tide Tables should be known to every navigator. By means of this table the predictions given for the reference ports are extended so as to enable one to obtain the predictions for each day for a large number of other stations. Table 3 enables the height of tide at any time to be computed. Table 4 gives the time of the rising and setting of the sun. Table 6 gives the time of the rising and setting of the moon at certain places.

The effect of strong winds, in combination with the regular tidal action, may at times cause the water to fall considerably below the plane of reference of the chart. The water may also rise about the same amount above mean high water due to similar causes.

Caution.—In using the Tide Tables, slack water should not be confounded with high or low water. For ocean stations there is usually but little difference between the time of high or low water and the beginning of ebb or flood current; but for places in narrow channels, land-locked harbors, or on tidal rivers, the time of slack current may differ by several hours from the time of high- and low-water stand. The relation of the times of high and low water to the turning of the current depends upon a number of factors, so that no simple or general rule can be given. To obtain the times of slack water, reference should be made either to figures given for various places in this volume of the Coast Pilot or to the Current Tables.

Current Tables for the **Atlantic Coast** and for the **Pacific Coast** (two volumes) of the United States are published in advance annually by the United States Coast and Geodetic Survey. Each volume includes the daily predicted times of slack water and the times and velocities of strength of flood and ebb for certain reference stations and a table of current differences and constants by means of which corresponding daily predictions may be readily obtained for numerous other places. Tables for the velocity of current at any time, duration of slack, and rotary tidal currents at certain offshore locations, together with data on the Gulf Stream and wind currents are included. There are also current diagrams for a number of sounds, bays, and harbors, which show in a graphical form the velocities of the flood and ebb currents and the times of slack and strength over a considerable stretch of the channel of these waterways. These tables are for sale by the Coast and Geodetic Survey, Washington, D. C., and by authorized sales agencies.

Tidal Current Charts are published by the United States Coast and Geodetic Survey for various localities, see List of Publications. These current charts are good for any year and show the direction and velocity of the tidal current for each hour of the current. They present a comprehensive view of the tidal current movement of the area as a whole and also supply a means of readily determining the direction and velocity of the current at various localities throughout the area.

WIND CURRENTS

There are given below the results of recent investigations on the currents caused by local winds. These investigations are based on observations made on a number of the lightships along the Atlantic coast from Nantucket Shoals Lightship to Brunswick Lightship. The results, therefore, apply more directly along the route between lightships but are applicable also to the coastal sailing routes farther offshore.

Direction of current due to wind.—It is evident that a wind continuing for some time will give rise to a current, the velocity of which increases with an increase in the

velocity of the wind; and the mariner has taken it for granted that this current brought about by the wind sets in the same direction as the wind. But the results of careful observations show that this is not the case. Instead of setting with the wind, the current on the Atlantic coast of North America produced by local winds sets on the average about 20° to the right of the wind.

For example, a wind blowing from north will, on the North Atlantic coast, bring about a current that sets not south but about 20° to the right of south, or 200°. Similarly a wind from south will produce a current setting 20° to the right of north, or 20°. It is to be noted that while the current due to the wind will, on the North Atlantic coast, set 20° to the right of the wind direction, the current which a vessel experiences at any time is the resultant of the combined action of the tidal current, the wind current, and any other currents, such as the Gulf Stream or currents due to river discharge.

Velocity of current due to wind.—The velocity of the current brought about by winds of different velocities is given in the table below. It will be seen that on the Atlantic coast of the United States the velocity of the wind current is about 1½ percent of the velocity of the wind.

Table of Current Velocity Due to Wind—North Atlantic Coast

Wind velocity——miles per hour—	10	20	30	40	50	60
Current velocity——knots—	0. 2	0. 3	0. 4	0. 6	0. 8	1. 0

An easily remembered working rule to get the velocity of the current due to wind along the *Atlantic coast* is to multiply the velocity of the wind (in miles per hour) by 1½ and point off two places. This will give the velocity of the current in knots. For example, to determine the current due to a 40-mile wind we have $40 \times 1\frac{1}{2} = 60$, and pointing off two decimal places gives 0.60, or six-tenths of a knot.

Pacific Coast.—In general it may be said that along the Pacific coast of the United States at a distance of from 5 to 10 miles offshore, the wind brings about a current having a velocity about 2 percent that of the wind. The direction of this wind-driven current, however, is not with the wind. With winds from the northeast, southeast, and northwest quadrants, the current sets about 20° to the right of the wind, while with winds from the southwest quadrant the current sets about 20° to the left of the wind. It is evident, however, that these are but average values, for strong currents are sometimes experienced when the local winds are light.

Above values are approximate and may be much affected by local conditions.

DISTANCES BETWEEN PORTS

The Coast and Geodetic publication, *Distances Between United States Ports* (Serial No. 444) is a compilation of numerous tables of distances giving, in a condensed and convenient form, distances between the ports of the United States and its off-lying territories. The ports include all the important harbors and a sufficient number of minor ports so that distances can be given between points at short and fairly regular intervals along the various coasts. Each distance between two ports is along the shortest route marked by aids to navigation and affording a safe depth for the maximum draft that can enter both ports.

For ready reference and for use in combining these tables with those issued by other nations, a number of distances from United States to foreign ports are included.

This publication may be obtained from the Coast and Geodetic Survey, Washington, D. C., or from the sales agencies of the bureau at the various ports.

The table of distances given in the Appendix is typical of the tables given in the above publication; it is an abridgement of tables in the publication listing numerous additional ports. Distances in this table are given in nautical miles which may be converted approximately to statute miles by adding 15 percent to the distances given, and more precisely by multiplying the distance in nautical miles by 1.15155.

The Hydrographic Office publication No. 117, *Table of Distances Between Ports*, gives distances (in nautical miles), via the shortest navigable routes, between the principal world ports, including the principal United States ports. This publication may be obtained from the Hydrographic Office, Washington, D. C., or from authorized sales agencies in the various ports.

A more complete tabulation of distances between ports on the Great Lakes will be found in the bulletin *Survey of the Northern and Northwestern Lakes*, issued annually by the United States Lake Survey Office, Detroit, Mich.

See List of Publications.

PLANIMETRIC MAPS

Planimetric maps (without contours) compiled from air photographs covering extensive sections of the coastal areas of the United States are published by the United States Coast and Geodetic Survey. These maps give detailed topographic features but no elevations, contours, or depths. The nautical chart gives the depths in the water areas, the shore line, important land features, and all other information essential to the navigator; the maps simply give additional detail of land-areas. The maps vary considerably in size, being laid out to conform with the coast line as conveniently as possible The average size is about 44 inches by 24 inches or a nearby equivalent area. The scale of the maps varies, the majority being on a scale of 1:20,000 but a 1:10,000 scale and at times a 1:5,000 scale is used. On these scales, the approximate area covered by an average sheet is 80 square miles (nautical), 20 square miles, and 5 square miles, respectively.

Index sheets showing the geographical layout of these maps may be secured from the Coast and Geodetic Survey, Washington, D. C. The maps are sold for 75 cents per copy.

The areas for which these maps are available within the limits of this pilot are given in the Appendix.

ARMY ENGINEERS

The improvement of the rivers and harbors of the United States and miscellaneous civil works are under the charge of the **Corps of Engineers, United States Army.**

The miscellaneous civil works under the corps of Engineers include the administration of the Federal laws enacted for the protection and preservation of navigable waters of the United States, the establishment of regulations for the use, administration, and navigation of navigable waters, the approval of plans of bridges, the alteration of obstructive bridges, the establishment of anchorage grounds and harbor lines, the removal of sunken vessels obstructing or endangering navigation, the granting of permits for structures or operations in navigable waters, etc.

The attention of navigators is called to the various publications of the United States Engineers relative to matters of nautical interest, which are listed under "Publications" on page 29 of this volume.

Information concerning the various ports, improvements, channel depths, navigable waters, and the condition of the Intracoastal Waterway in the areas under their jurisdiction may be obtained direct from the District Engineer Offices.

Anchorage Areas in some places are defined and limited by the United States Engineers. They also publish *regulations* controlling the use of these anchorage areas. These are enforced by the United States Coast Guard. The areas are shown on the *large scale charts* of the Coast and Geodetic Survey. Copies of the regulations may be obtained at the offices of the United States Engineers. A list of the district offices and their locations in the area covered by this pilot is given in the Appendix.

The Port Series, publications of the United States Army, Corps of Engineers, are complete reports covering the principal seaports of the United States; they are primarily of interest to commercial and industrial concerns. The volumes of the series are wide in their scope and treat the subjects of particular interest to the shipping world, such as the physical features of each port (includes list of piers, wharves, and docks, with data), its organization and practices, regulations regarding the movement of ships and goods, port dues and charges, water and rail connections, and character and commerce of the hinterland.

The information in all these reports is generally prepared along similar lines; the general subjects covered include the following:

Port and harbor conditions.
Port customs and regulations.
Port services and charges.
Fuel and supplies.
Port and harbor facilities.
Communications.
The freight-rate situation.
Commerce reports.

Those volumes of the Port Series concerning ports within the area covered by this Coast Pilot are listed in the Appendix.

The publication, **Port and Terminal Charges at United States Ports,** Miscellaneous Series, No. 1, also prepared by the United States Army Corps of Engineers and sold by the Superintendent of Documents, gives detailed information regarding all port services and charges (including dockage, wharfage, storage, handling charges, etc.) at practically all ports of the United States. This publication includes the more important governmental regulations affecting the movement of vessels, freight, and passengers. This information includes a digest of the more important regulations of the United States Public Health Service (quarantine and hospital services), the Customs Service and the Immigration Service; it also includes a list of Federal documents which vessels are required to have.

Protection of Navigable Waters.—There are given below extracts from the laws of the United States for the protection and preservation of the navigable waters of the United States.

That it shall not be lawful to throw, discharge, or deposit, or cause, suffer, or procure to be thrown, discharged, or deposited either from or out of any ship, barge, or other floating craft of any kind, or from the shore, wharf, manufacturing establishment, or mill of any kind, any refuse matter of any kind or description whatever other than that flowing from streets and sewers and passing therefrom in a liquid state, into any navigable water of the United States, or into any tributary of any navigable water from which the same shall float or be washed into such navigable water; and it shall not be lawful to deposit, or cause, suffer, or procure to be deposited material of any kind in any place on the bank of any navigable water, or on the bank of any tributary of any navigable water, where the same shall be liable to be washed into such navigable water, either by ordinary or high tides, or by storms or floods, or otherwise, whereby navigation shall or may be impeded or obstructed.

That it shall not be lawful to tie up or anchor vessels or other craft in navigable channels in such a manner as to prevent or obstruct the passage of other vessels or craft; or to voluntarily or carelessly

sink, or permit or cause to be sunk, vessels or other craft in navigable channels; or to float loose timber and logs, or to float what is known as sack rafts of timber and logs in streams or channels actually navigated by steamboats in such manner as to obstruct, impede, or endanger navigation. And whenever a vessel, raft, or other craft is wrecked and sunk in a navigable channel, accidentally or otherwise, it shall be the duty of the owner of such sunken craft to immediately mark it with a buoy or beacon during the day and a lighted lantern at night, and to maintain such marks until the sunken craft is removed or abandoned, and the neglect or failure of the said owner so to do shall be unlawful; and it shall be the duty of the owner of such sunken craft to commence the immediate removal of the same, and prosecute such removal diligently, and failure to do so shall be considered as an abandonment of such craft, and subject the same to removal by the United States as hereinafter provided for.

That, except in case of emergency imperiling life or property, or unavoidable accident, collision, or stranding, and except as otherwise permitted by regulations prescribed by the Secretary as hereinafter authorized; it shall be unlawful for any person to discharge, or suffer, or permit the discharge of oil by any method, means, or manner into or upon the coastal navigable waters of the United States from any vessel using oil as fuel for the generation of propulsion power, or any vessel carrying or having oil thereon in excess of that necessary for its lubricating requirements and such as may be required under the laws of the United States and the rules and regulations prescribed thereunder. The Secretary is authorized and empowered to prescribe regulations permitting the discharge of oil from vessels in such quantities, under such conditions, and at such times and places as in his opinion will not be deleterious to health or sea food, or a menace to navigation, or dangerous to persons or property engaged in commerce on such waters, and for the loading, handling, and unloading of oil.

HYDROGRAPHIC OFFICE

The **Hydrographic Office** of the United States Navy exists for the improvement of the means of navigating safely the vessels of the United States Navy and of the mercantile marine by providing accurate nautical charts, light lists, and sailing directions (pilots) of foreign navigable waters, navigator's tables and manuals of instruction for the use of all vessels of the United States, and for the benefit and use of navigators generally.

The charts and coast pilots pertaining to the territorial waters of the United States and its possessions are published by the United States Coast and Geodetic Survey.

Among the publications of the Hydrographic Office are monthly pilot charts for the various oceans, a weekly notice to mariners (domestic and foreign waters), a weekly hydrographic bulletin, and a daily memorandum of information of interest to navigators. These publications can be secured by mariners who cooperate with the bureau by furnishing certain desired marine data. It also publishes numerous special charts, books, manuals, and tables of interest to navigators and aviators. Navigational warnings for the hydrographic radio broadcasts are prepared.

The **Notice to Mariners** will be mailed free to mariners who apply to the Hydrographer, United States Hydrographic Office, Washington, D. C., or single copies may be obtained or consulted at the Branch Hydrographic Offices or at the District Offices of the Coast Guard or the Coast and Geodetic Survey, or other agencies, distributing marine information.

Branch Hydrographic Offices within the area covered by this volume are listed in the Appendix. In these offices, bulletins are posted giving information of value to mariners who can also avail themselves of publications pertaining to navigation and facilities for correcting their charts from standards. No charge is made for this service.

WEATHER BUREAU

The **Weather Bureau** has charge of weather forecasting, including the issuance and display of weather forecasts, and storm, hurricane, cold-wave, frost, forest-fire,

and flood warnings. It collects and transmits marine meteorological information for the benefit of commerce and navigation, records and reports rainfall and temperature conditions, etc. Meteorological tables issued by this Bureau for various ports are given in the Appendix.

STORM SIGNALS

Storm signals are displayed by the United States Weather Bureau at numerous places on the coast of the United States and the Great Lakes. All storm signal display stations in the area covered by this coast pilot are tabulated in the Appendix.

These storm signals are used to warn of the approach of a storm of marked violence with the beginning to blow from the indicated direction.

The mariner must bear in mind that the storm signals do not necessarily mean that a storm will occur at the place where the signal is displayed, but that one is expected either there or within such a distance that vessels leaving port would be liable to be caught in it.

DAY SIGNALS:

Two pennants, red and white, and one flag, square, red, with black center, used either alone or in combination and have the following meanings:

Red pennant.—Small craft warning indicates that moderately strong winds that will interfere with the safe operation of small craft is expected.

Red pennnant over flag.—Northeast storm.

White pennant over flag.—Northwest storm.

Flag over red pennant.—Southeast storm.

Flag over white pennant.—Southwest storm.

Two flags.—Hurricane or whole gale.

NIGHT SIGNALS:

Red and white lanterns having the following meanings are used at night:

Red lantern.—Southeast storm.

Red lantern over white lantern.—Southwest storm.

Two red lanterns.—Northeast storm.

Two red lanterns with white lantern between.—Hurricane or whole gale.

White lantern over red lantern.—Northwest storm.

For additional information regarding weather broadcasts see Radio Services.

COAST GUARD

The **Coast Guard** has among its duties the following:

Enforcement of the laws of the United States on the high seas, in harbors, bays, sounds, roadsteads, and other like bodies of water along the coasts of the United States, its territories and possessions.

Enforcement of navigation laws.

Enforcement of neutrality laws and regulations.

Enforcement of rules and regulations in relation to anchorage grounds.

Enforcement of the Oil Pollution Act.

Inspection of all vessels to insure safety to passengers and crews.

Aid to distressed mariners and saving of life and property from shipwreck.

Issuance of marine licenses and certificates.

Investigation of circumstances connected with shipwreck or collision at sea.

Destruction of derelicts.

Construction, operation, maintenance and inspection of aids to navigation.
Publication of *Light Lists* and *Radiobeacon Charts*.

AIDS TO NAVIGATION

The lighthouses and lightships, radiobeacons, radio direction-finder and distance-finding stations, and other aids to navigation are the principal guides, and mark the approaches and channels to the principal ports. The buoyage is in accordance with the system adopted by the United States and is described below. The lightships and principal coast lights are described in the text of this volume. Some of the light stations are equipped with radiobeacons and distance-finding apparatus.

Private aids to navigation, such as stakes and small floats, are not supervised by the Government, and are therefore not listed or indicated on the charts. When private aids are established similar to those maintained by the Government, they must be authorized by the United States Coast Guard.

Light Lists.—All aids to navigation, such as radiobeacons, lights, fog-signals, buoys, and day marks, maintained by the United States Coast Guard are described in these publications, which are for sale by the Superintendent of Documents, Government Printing Office, Washington, D. C., or by numerous sales agencies. The various lists published are given under Publications on page 28 of this volume. Each of these publications also lists the radiobeacons and the radio direction-finder stations operated by the United States Coast Guard.

Mariners are referred to the above publications for detailed information regarding the characteristics, power, visibility, etc., of lights, as wells as a description of light structures and day marks, buoys, fog-signals, etc. Such detailed information is not given in this Coast Pilot Volume.

Color of Lightships.—All lightships in United States waters, except Ambrose Lightship, are painted red with name of the station in white on both sides, superstructures are white, masts, lantern galleries, ventilators and stacks are painted buff.

Lights on Lightships are displayed from 1 hour before sunet to 1 hour after sunrise and at all times when the sound signal is in operation.

Lightships under way, or off station, will fly the International Code signal letters "PC" (signifying "lightship is not at anchor on her station").

All lightships on station and all vessels relieving station ships will display the International Code signal of the station whenever a vessel is approaching or in the vicinity and there are indications that such vessel is in strange waters or fails to recognize the station, or when the vessel asks for the information.

Lightships, where so stated, carry riding lights for the purpose of showing in which direction the ship is riding.

Casualties and near casualties to lightships impose upon the Coast Guard the obligation to CAUTION all shipmasters that courses should invariably be set to pass lightships with sufficient clearance to avoid possibility of collision from any cause. Errors of observation, current and wind effects, other vessels in the vicinity, and defects in steering-gear may and have been the causes of actual collisions, or imminent danger thereof, needlessly jeopardizing the safety of lightships and their crews, and that of all navigation dependent on these important aids to navigation. Experience shows that lightships cannot be safely used as leading marks to be passed close aboard, but should invariably be left broad off the course, whenever sea-room permits.

Day beacons are constructed and distinguished with special reference to each locality, and particularly with regard to the background upon which they are projected.

Beacons on the sides of channels are, when practicable, colored to conform to the coloring of buoys, subject to the above conditions as to background.

Reflectors (red or white) are placed on some buoys or day beacons to enable the navigator, using a searchlight, to readily locate such aids.

Radiobeacons.—For information regarding operating schedules, transmitting range, station identification, etc., see *Light List.*

Caution must be used in approaching radiobeacons on radio bearings, and care must be taken to set courses to pass safely clear. The risk of collision will be avoided by insuring that the radio bearing does not remain constant. This caution is applicable to those lightships and stations on submarine sites which are passed close to.

System of buoyage, colors, shapes, and numbers.—On the *right or starboard* side of the channel for the entering vessels are placed *spar or nun buoys*, painted *red*, and with *even numbers*, and on the *left or port side*, *spar or can buoys*, painted *black*, and with *odd numbers;* the numbers for each side increase from seaward.

Obstructions, with channel ways on either side, are marked with buoys painted with *red and black horizontal bands*, which may be left on either side, with due regard as to the position of the buoy with relation to the obstruction, as shown on the chart. In general, obstruction buoys have no distinctive shape, but in the case of buoys with horizontal bands marking obstructions or bifurcations of channels, when it is desired to indicate the main channel, a can buoy with black band at the top is used when the important channel is to the right, for the entering vessel, and a nun buoy with red band at the top when the important channel is to the left.

Fairways are indicated, where necessary, by buoys painted with *black and white vertical stripes;* such buoys are placed in good water in midchannel or approaches, and may be passed close-to on either side. Midchannel buoys have no distinctive shape at present.

Offshore Buoys along the Atlantic Coast are colored and numbered from north to south, and along the Pacific coast from south to north, conforming to the order of Light Lists; this does not apply to outside buoys which have a definite approach signification, and which are colored and numbered to conform to the approach. In channels not having a definite approach character, buoys are colored and numbered from north to south or from east to west on the Atlantic coast and from south to north or west to east on the Pacific coast.

Bell buoys have a flat-topped float with skeleton superstructure supporting a bell. **Gong buoys** have a flat top with skeleton framework supporting a series of four gongs of varied tone. **Whistle buoys** are conical, with whistle at top. **Spar buoys** are long slender buoys of wood or iron. These classes of buoys, as well as lighted buoys, have not at present a shape distinction to indicate the side of channel or entrance, although a shape distinction is being introduced for wood spar buoys.

Anchorage Buoys are painted white.

Quarantine Anchorage Buoys are painted yellow.

Certain Other Special Buoys are in use locally, such as white with green top for dredging buoys.

Station Buoys, colored the same as the regular aids, are placed alongside of lightships and important buoy stations to mark them in case the regular aid is carried away. Lightship station buoys bear the letters "LS" above the initials of the station.

Colors of Lights for Buoys and Beacons.—*Red or white lights* are placed on the *right or starboard* side of a channel for the entering vessel, and *white or green lights* on

the *left or port side*. White lights may be on either or both sides of the channel, but colored lights are only on the sides indicated respectively. The same rules apply to lights on fixed structures serving a purpose similar to that of buoys. Coast lights and lightships near channels or entrances may not conform to this system.

Lighted buoys are not at present uniformly differentiated as to shape, with respect to the side of the channel; they have bodies which contain the gas tanks or gas, and are usually surmounted by skeleton superstructures with lanterns; combination buoys have both light and bell, or light and whistle.

Significance of light characteristics

(FLASHING CHARACTERISTICS ARE USED ON LIGHTED BUOYS TO DISTINGUISH THEIR PRINCIPAL PURPOSES CORRESPONDING IN PART TO THE COLOR DISTINCTIONS THAT ARE MADE ON UNLIGHTED BUOYS)

Characteristic of flashing	Purpose indicated	Color of light	Color of buoy
1. Flashing: Less than 30 light periods per minute.	Channel sides and coasts	White	Red or black.
		Green	Black.
		Red	Red.
2. Quick flashing: Not less than 60 flashes per minute.	Sudden constriction or sharp turns in channel; also wrecks when marked by solid color buoys. *A distinctly cautionary significance is indicated.*	White	Black or red.
		Green	Black.
		Red	Red.
3. Interrupted quick flashing (group): Quick flashing as above but interrupted by eclipse periods of 4 seconds at regular intervals about 8 times per minute.	Obstructions, middle grounds, junctions, or wrecks. *A distinctly cautionary significance is indicated.*	--------	Horizontally striped buoy.
		White	Top band of buoy either red or black.
		Green	Top band of buoy black only.
		Red	Top band of buoy red only.
4. Short-long flashes: Groups of a short and a long flash. Groups are repeated about 8 times per minute.	Midchannels and fairways	White	Black and white vertical stripes.

NOTE.—While a thorough understanding of the significance of these features will be of material assistance to the navigator, it is not contemplated that they shall be implicitly relied upon without reference to the charts which should always be consulted for guidance. Many conditions do not permit of proper understanding in any other way.

Caution regarding buoys.—Buoys are liable to be carried away, shifted, capsized, sunk, etc., lighted buoys may be extinguished, or whistling or bell buoy may not sound, as the result of storm, the accumulation of ice, running ice, or other natural causes, or collision, or other accidents. Buoys marking channels subject to frequent changes are moved as may be necessary and should be used only with local knowledge. Such buoys may not be charted.

Coast Guard tenders, when working on buoys in channels or other frequented waters, may display a red flag (international signal code flag B) and a black ball at the fore as a warning to other vessels to slow down in passing. Passing vessels will facilitate the work of the U. S. Coast Guard by a proper observance of the signals.

Suggestions as to aids to navigation.—Mariners are also invited to send suggestions as to improvements or changes in aids to navigation directly to the District Commander of the district concerned, or to confer with them, or address Commandant, United States Coast Guard, Washington, D. C.

Defects in aids to navigation.—Aids to navigation are protected by law, and mariners in their own interest should use every precaution to avoid collisions with them. Mariners are requested to report defects in the aids to navigation *using official designa-*

tion identification in the Light Lists direct to the District Commander, United States Coast Guard of the district concerned by commercial radio, by radio communication with lightships, or other prompt means.

Messages may be sent by telegraph collect. Radio reports should be sent using the registered address **COGUARD** with the name of the city in which the district office is located. Example, "Coguard, Boston"; "Coguard, New York."

Coast Guard stations are maintained at the places named in the Appendix. The active stations are fully manned throughout the year and are supplied with boats, wreck guns, beach apparatus, and all other appliances for affording assistance in case of shipwreck. Instructions to enable mariners to avail themselves fully of the assistance thus afforded are given below.

INSTRUCTIONS TO MARINERS IN CASE OF SHIPWRECK

(INSTRUCTIONS FOR USE OF GUN APPARATUS MUST BE POSTED BY LAW)

General information.—Coast Guard (lifesaving) stations and houses of refuge are located upon the Atlantic and Pacific seaboards of the United States, the Gulf of Mexico, and the Lake coasts.

The stations are manned throughout the year by crews of experienced surfmen.

All lifesaving stations, except inactive stations, are fully supplied with boats, wreck guns, beach apparatus, and restoratives.

The lifesaving stations are provided with the International Code of Signals, and other means of visual signaling, and vessels can, by opening communication, be reported; or obtain the latitude or longitude of the station, where determined; or information as to the weather probabilities in most cases; or where facilities for the transmission of messages by telephone or telegraph are available, request for a tug or Coast Guard cutter will be received and promptly forwarded.

All services are performed by the lifesaving crews without other compensation than their pay from the Government.

Destitute seafarers are provided with food and lodging at the nearest station by the Government as long as necessarily detained by the circumstances of shipwreck.

The station crews patrol the beach from 2 to 4 miles each side of their stations between sunset and sunrise, and if the weather is foggy the patrol is continued through the day. A continuous lookout is also maintained at every station night and day.

Each patrolman carries warning signals. Upon discovering a vessel standing into danger he ignites one of these, which emits a brilliant red flame of about 2 minutes' duration, to warn her off, or, should the vessel be ashore, to let her crew know that they are discovered and assistance is at hand.

If the vessel is not discovered by the patrol immediately after striking, rockets, flare-up lights, or other recognized signals of distress should be used. If the weather be foggy, some recognized sound signal should be made to attract attention, as the patrolman may be some distance away at the other end of his beat.

Masters are particularly cautioned, if they should be driven ashore anywhere in the neighborhood of the stations, to remain on board until assistance arrives and under no circumstances should they attempt to land through the surf in their own boats until the last hope of assistance from shore has vanished. Often when comparatively smooth at sea a dangerous surf is running which is not perceptible 400 yards offshore, and the surf when viewed from a vessel never appears as dangerous as it is. Many lives have been lost unnecessarily by the crews of stranded vessels being thus deceived and attempting to land in the ship's boats.

The difficulties of rescue by operations from the shore are greatly increased in cases where the anchors are let go *after entering the breakers*, as is frequently done, and the chances of saving life correspondingly lessened.

Rescue with the lifeboat or surfboat.—The patrolman after discovering your vessel ashore and burning a warning signal, hastens to his station or the telephone for assistance. If the use of a boat is practicable, either the large lifeboat is launched from its ways in the station and proceeds to the wreck by water, or the lighter surfboat is hauled overland to a point opposite the wreck and launched, as circumstances may require.

Upon the boat reaching your vessel the directions and orders of the officer in charge (who always commands and steers the boat) should be implicitly obeyed. Any headlong rushing and crowding

should be prevented, and the captain of the vessel should remain on board, to preserve order, until every other person has left.

Women, children, helpless persons, and passengers should be passed into the boat first.

Goods or baggage will positively not be taken into the boat until all are landed. If any be passed in against the remonstrance of the officer in charge, he is fully authorized to throw the same overboard.

Rescue with the breeches buoy or life car.—Should it be inexpedient to use either the lifeboat or surfboat, recourse will be had to the wreck gun and beach apparatus for the rescue by the breeches buoy or the life car.

A shot with a small line attached will be fired across your vessel. Get hold of the line as soon as possible and haul on board until you get a tailblock with a whip or endless line rove through it. The tailblock should be hauled on board as quickly as possible to prevent the whip drifting off with the set or fouling with wreckage, etc. Therefore if you have been driven into the rigging, where but one or two men can work to advantage, cut the shot line, and run it through some available block, such as the throat or peak-halyards block, or any block which will afford a clear lead, or even between the ratlines, that as many as possible may assist in hauling.

Attached to the tailblock will be a tally board with the following directions in English on one side and French on the other:

"Make the tail of the block fast to the lower mast, well up. If the masts are gone, then to the best place you can find. *Cast off shot line, see that the rope in the block runs free,* and show signal to the shore."

As soon as your signal is seen, a 3-inch hawser will be bent onto the whip and hauled off to your ship by the lifesaving crew.

If cirsumstances permit, you can assist the lifesaving crew by manning that part of the whip to which the hawser is bent and hauling with them.

When the end of the hawser is got on board, a tally board will be found attached, bearing the following directions in English on one side and French on the other:

"Make this hawser fast about 2 feet above the tailblock, see all clear and that the rope in the block runs free and show signal to the shore."

Take particular care that there are no turns of the whip line around the hawser. To prevent this. take the end of the hawser up between the parts of the whip before making it fast.

When the hawser is made fast, the whip cast off from the hawser, and your signal seen by the lifesaving crew, they will haul the hawser taut and by means of the whip will haul off to your vessel a breeches buoy suspended from a traveler block, or a life car, from rings running on the hawser.

If the breeches buoy be sent, let one man immediately get into it, thrusting his legs through the breeches. If the life car, remove the hatch, place as many persons therein as it will hold (four to six) and secure the hatch on the outside by the hatch bar and hook, signal as before, and the buoy or car will be hauled ashore. This will be repeated until all are landed. On the last trip of the life car the hatch must be secured by the inside hatch bar.

In many instances two men can be landed in the breeches buoy at the same time by each putting a leg through a leg of the breeches and holding onto the lifts of the buoy.

Children when brought ashore by the buoy should be in the arms of older persons or securely lashed to the buoy. Women and children should be landed first.

In signalling as directed in the foregoing instruction, if in the daytime, let one man separate himself from the rest and swing his hat, a handkerchief, or his hand; if at night, the showing of a light and concealing it once or twice will be understood; and like signals will be made from the shore. (See also Wreck Signals, below.)

Circumstances may arise, owing to the strength of the current or set or the danger of the wreck breaking up immediately, when it would be impossible to send off the hawser. In such a case a breeches buoy or life car will be hauled off instead by the whip or sent off to you by the shot line, and you will be hauled ashore through the surf.

If your vessel is stranded during the night and discovered by the patrolman—which you will know by his burning a brilliant red light—keep a sharp lookout for signs of the arrival of the livesaving crew abreast of your vessel.

Some time may intervene between the burning of the light and their arrival, as the patrolman may have to return to his station, perhaps 3 or 4 miles distant, and the livesaving crew draw the apparatus or surfboat through the sand or over bad roads to where your vessel is stranded.

Lights on the beach will indicate their arrival, and the sound of cannon firing from the shore may be taken as evidence that a line has been fired across your vessel. Therefore upon hearing the cannon,

make strict search aloft, fore, and aft, for the shot line, for it is almost certain to be there. Though the movement of the lifesaving crew may not be perceptible to you, owing to the darkness, your vessel will be a good mark for the men experienced in the use of the wreck gun, and the first shot seldom fails.

Important.—Remain by the wreck until assistance arrives from the shore, or as long as possible. If driven aloft, the inshore mast is the safest.

If not discovered immediately by the patrol, burn rockets, flare-up, or other lights, or if the weather be foggy, fire guns or make other sound signals.

Make the shot line fast on deck or to the rigging to prevent its being washed into the sea and possibly fouling the gear.

Take particular care that there are no turns of the whip line around the hawser before making the hawser fast.

Send the women, children, helpless persons, and passengers ashore first.

Make yourself thoroughly familiar with these instructions, and remember that on your coolness and strict attention to them will greatly depend the chances of success in bringing you and your people safely to land.

Wreck signals.—The following signals have been adopted by the Coast Guard and will be used and recognized by the officers and employees as occasion may require:

"Upon the discovery of a wreck by night, the lifesaving force will burn a red pyrotechnic light or a red rocket to signify, '*You are seen; assistance will be given as soon as possible.*'

"A red flag waved on shore by day, or a red light, red rocket, or red roman candle displayed by night, will signify, '*Haul away.*'

"A white flag waved on shore by day, or a white light slowly swung back and forth, or a white rocket, or white roman candle fired by night, will signify, '*Slack away.*'

"Two flags, a white and red, waved at the same time on shore by day, or two lights, a white and a red, slowly swung at the same time, or a blue pyrotechnic light burned by night, will signify, '*Do not attempt to land in your own boats; it is impossible.*'

"A man on shore beckoning by day, or two torches burning near together by night, will signify, '*This is the best place to land.*'

"Any of these signals may be answered from the vessel as follows: In the daytime, by waving a flag, a handkerchief, a hat, or even the hand; at night, by firing a rocket, a blue light, or a gun, or by showing a light over the ship's gunwale for a short time, and then concealing it."

DISTRESS SIGNALS USED BY SUBMARINE AND AIRCRAFT

Distress signals by submarines.—The following signals are made by submarines of the United States Navy in cases of necessity.

A submarine in need of assistance releases a red smoke bomb.

A submarine compelled to surface in the vicinity of surface craft releases a yellow smoke bomb. Surface vessels should keep clear of these yellow smoke bombs.

Any person sighting red smoke bombs rising from the surface of the water should report the time and location to the nearest Naval authority or Coast Guard unit.

Distress signals by aircraft.—The attention of all navigators of surface vessels is called to the procedure which will be followed by the planes of a Naval squadron when a plane is forced down at sea, in order that assistance may be rendered as quickly as possible.

A plane will fly several times across the bow of the nearest surface vessel, opening and closing the throttle, and then will fly in the direction of the plane in distress. The signal will be repeated until the ship has acknowledged by following the plane. If possible, the plane will remain in sight of the surface vessel until the latter sights the plane in distress. All planes will resort to the use of available pyrotechnics as necessary to attract the attention of surface vessels.

REPORTS OF ACCIDENTS

The licensed officer in command of any vessel shall report in writing and in person to the Coast Guard officer nearest the port of first arrival any accident to said vessel

involving loss of life, or damage to property, and shall also report in like manner any casualty or loss of life from whatever cause of any person on board such vessel and any stranding or grounding, whether or not any damage has been sustained by the vessel.

CUSTOMS

Collection districts and ports of entry located within the area covered by this volume are tabulated in the Appendix.

QUARANTINE AND HEALTH

The **United States Public Health Service** is the governmental guardian of the public health, working to prevent the spread of human contagious and infectious diseases.

In addition to its other duties, this Bureau administers hospitalization and out-patient treatment at marine hospitals and many other relief stations to legal beneficiaries of the Government; it administers the foreign and domestic quarantine laws, supervising the medical examination of immigrants and enforcing interstate quarantine laws.

American merchant seamen are entitled to medical relief obtainable through the United States Public Health Service at its established relief stations.

An American seaman is one engaged on board in care, preservation, or navigation of any registered, enrolled, or licensed vessel of the United States, or in the service, on board, of those engaged in such care, preservation, or navigation.

Relief stations of the Public Health Service are located at the addresses given in the Appendix.

Free medical advice is furnished to seamen by radio, see page 23.

Quarantine regulations are given in the text under the names of the ports.

In general, where State quarantine is in force, the minimum requirements of quarantine are in accordance with the regulations of the United States Public Health Service. National quarantine regulations will be found at the stations of the service and at American consulates, and will be furnished to vessels upon application, either by officers of the service or by the bureau in Washington, D. C.

RADIO

LEGAL RESPONSIBILITY

Radio supervision.—The radio communications in the United States and its possessions, except the Philippine Islands and the Panama Canal Zone, are controlled by the Federal Communications Commission, Washington, D. C.

Responsibility of shipmasters.—Shipmasters have the responsibility of seeing that the general radio regulations are carried out by the radio operators.

Radio inspectors.—Inspectors of the Federal Communications Commission have authority to board ships at United States ports for the inspection of the radio station to determine whether it complies with international treaties, Federal laws, and such rules and regulations of the Federal Communications Commission which may apply. In general, these inspectors operate at the following ports where field offices of the Commission are located and where information concerning radio regulations and communications may be obtained.

Boston, Mass.
New York, N. Y.
Philadelphia, Pa.
Baltimore, Md.
Norfolk, Va.
Savannah, Ga.
Miami, Fla.
San Juan, P. R.
Tampa, Fla.
New Orleans, La.
Beaumont, Tex.
Galveston, Tex.
San Diego, Calif.
Los Angeles, Calif.
San Francisco, Calif.
Portland, Oreg.
Seattle, Wash.
Juneau, Alaska.
Honolulu, T. H.

Service documents.—The rules and regulations of the International Telecommunication Convention require that when a radio-transmitting installation is compulsory equipment on board a ship, the latter must be provided with the following service documents:

1. The radio license.
2. The operators' certificates.
3. Register (**radio service log**) in which shall be noted, at the time they occur, service incidents of all kinds, as well as the communications exchanged with land stations or mobile stations and relating to reports of disaster. If the regulations on board permit, the position of the ship shall be indicated once a day in the said register.
4. Alphabetical list of call letters.
5. List of coast and ship stations.
6. List of stations performing special services.
7. The general radio regulations and the additional radio regulations as well as the provisions of the convention necessary for the operations of radio-communication service on board ships.
8. The telegraph rates of the countries for which the station (ship) most frequently accepts radiotelegrams.

The rules and regulations of the United States Federal Communications Commission require certain vessels to have additional service documents, a complete list of which may be obtained from the Federal Communications Commission, Washington, D. C., or from its suboffices.

For further details concerning the above rules and regulations consult the following publications:

Ship Radiotelegraph Safety Rules.
The Communications Act of 1934, with amendements.
Radio Navigational Aids, H. O. 205.
Radio Weather Aids to Navigation, H. O. 206.

WEATHER BROADCASTS

1. **The major weather bulletins,** issued daily via United States Naval Radio Stations (NAA/NSS), Washington, D. C., and (NPG) San Francisco, Calif., include observations from ships at sea; surface weather observations from selected land stations; forecasts, storm warnings, and a summary of general atmospheric pressure distribution. The information contained in these bulletins is suitable for preparing weather maps at sea.

The forecasts included in the Washington, D. C., bulletins are for coastal and contiguous ocean areas of the western North Atlantic Ocean from Eastport to the Florida Straits, the Gulf of Mexico, and the Caribbean Sea west of longitude 75° W. A rebroadcast of parts of these bulletins is made via (NBA) Balboa (Summit), Panama Canal Zone, except that forecasts and warnings for the areas Eastport, Maine, to Jacksonville, Florida, inclusive, are omitted.

The broadcasts from San Francisco are for the North Pacific. Rebroadcasts of the San Francisco bulletins and of the bulletins issued by Cavite, P. I., are made daily by Oahu, T. H., with some omissions. Weather reports from stations in the South Pacific are included in the Oahu broadcasts.

2. Local weather bulletins containing forecasts, storm warnings when issued, and the weather summaries for specified areas are broadcast on schedule every day by certain Government and commercial radio stations.

During the West Indies hurricane season, July 1 to November 15, inclusive (NAU) San Juan, P. R., transmits daily and on schedule a weather bulletin issued for the eastern Caribbean Sea. This bulletin is rebroadcast by the United States Coast Guard vessel patrolling the waters of the United States West Indies when it is in the vicinity of Puerto Rico and the Virgin Islands.

3. Storm warnings, whenever they are issued by the United States Weather Bureau, are the subject of special broadcast by various Government and commercial radio stations of the mobile service.

United States naval shore radio stations concerned with the broadcasting of weather information transmit storm warnings in accordance with the urgency. Warnings of a *very urgent nature*, such as tidal waves, hurricanes, typhoons, cyclones, etc., when the danger is so imminent as to warrant its prompt divulgence, are broadcast as follows:

1. One transmission immediately upon receiving the message from the United States Weather Bureau.
2. One transmission at the end of the first silent period which follows the preceding transmission.
3. One transmission during the first ensuing "ON watch" period for ships with only one radio operator in case the two previous transmissions were both made during the "OFF watch" period.

Storm warnings of less urgency than the above and other than those normally included in the scheduled major and the local weather bulletins are broadcast as follows:

1. One transmission at the end of the first silent period which follows the reception of the message from the United States Weather Bureau.
2. One transmission during the first ensuing "ON watch" period in case the previous transmission occurred during an "OFF watch" period.

The broadcasting of storm warnings by other than United States Naval Radio Stations is made according to varying procedures. Broadcasts from commercial stations are generally made at hourly intervals on the hour or half-hour.

During the West Indies hurricane season, July 1 to November 15 (NAU), San Juan, Puerto Rico, broadcasts storm and hurricane warnings whenever they are issued by the United States Weather Bureau and in their absence the words "weather normal over Eastern Caribbean" are transmitted. These storm warnings are also broadcast and repeated hourly generally on the hour or half-hour by (WPR) Ensenada, Puerto Rico. This last station also transmits the warnings upon request.

Storm warnings are broadcast in plain language and on the frequencies assigned to the service (maritime or aeronautical) for which they are intended.

Scheduled radiotelegraphic broadcasts of weather information affecting the coasts of the United States, Canada, and Alaska, are also made by Mexican and Canadian radio stations. Most Canadian coastal stations of the mobile service supply weather information on request only and without charge.

Radiotelephonic broadcasts of **Weather** information (United States).—Transmission by voice of weather information from the United States Weather Bureau is made through certain radio stations of the United States Coast Guard. These broadcasts are followed immediately by reports of dangers, obstructions, and changes in aids to navigation.

This service gives to yachts, fishing vessels, tugboats, and any vessel within range, equipped with an ordinary radio receiving set, having a band covering the frequency range of 2 to 3 megacycles, direct official weather information from the Weather Bureau, in plain language, and on regular schedules, such as is available to ships equipped with radiotelegraph apparatus and operator. This service should also prove of value to dock terminals, pilots, yacht clubs, etc.

These radiophone broadcasts are made twice daily at definite times and consist of the transmission of weather bulletins issued by the United States Weather Bureau. The bulletins contain forecasts (and storm warnings whenever they are issued) for specified regions and adjacent coastal waters.

North of the United States, radiophone weather as well as navigational information, is furnished on request and on schedule, without charge, by certain Canadian radio stations.

West Indies.—Radiotelephonic broadcasts of storm and hurricane warnings are made by various stations in the West Indies.

Alaska.—Weather broadcasts by the Alaska Aeronautics and Communications Commissions are made by radiophone in plain language from Anchorage, Ketchikan, Fairbanks, Cordova, Juneau, and Nome. For times and schedules of broadcasts, see *Radio Weather Aids to Navigation H. O. 206.*

Complete details relative to the broadcasting of weather information are published in *Distribution of Weather Information by Radio (Radio Circular No. 1).*

This circular, together with a card descriptive of storm warnings, may be obtained upon application to any United States Weather Bureau office. Details are also given in *Radio Weather Aids to Navigation (H. O. 206).* These publications give the schedules with times and frequencies of weather broadcast, together with tables for decoding as needed.

Storm warnings are also broadcast 6 times at 2-hour intervals, whenever they are issued by the United States Weather Bureau. The first of these special broadcasts begins exactly 2 or 4 or 6 or 8 or 10 or 12 hours after the scheduled time of the regular broadcast, depending upon the time the message containing the warnings is received at the radio station. If the warnings are superseded by another message from the United States Weather Bureau before the completion of the 6 broadcasts, the later information is used and broadcast 6 times unless superseded again.

REPORTS FROM SHIPS

The master of every ship of the United States equipped with radio transmitting apparatus, on meeting with a tropical storm, dangerous ice, derelict, or any other direct danger to navigation, is required to cause to be transmitted a report of these dangers to ships in the vicinity and to the appropriate Government agencies.

Weather reports (United States).—Weather reports should not be sent regularly except from ships with which specific arrangements have been made by the United States Weather Bureau, but masters of all ships encountering tropical or other severe storms should send special observations by radio.

These reports should be sent in the international meterological code, preceded by the ship's name, unsigned, and checked collect.

If a copy of the international meteorological code is not on shipboard, the code will be found in *Radio Weather Aids to Navigation* (H. O. 206), or a copy may be obtained

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on application to the United States Weather Bureau, Washington, D. C. If code is impracticable, the message may be sent in plain language.

During the West Indies hurricane season, June 1 to November 30, ships in the Gulf of Mexico, Caribbean Sea, and southern North Atlantic Ocean are urged to cooperate with the United States Weather Bureau in order that more complete information may be supplied to ships and for the purpose of warning the inhabitants of coastal ares.

Ice reports.—When in the vicinity of the Grand Banks during the whole of the ice season (generally from March to July), mariners are requested to report to the United States Coast Guard cutter (call letters NIDK) of the International North Atlantic Ice Patrol, any field ice, icebergs, or obstructions sighted or reported sighted, giving the date, time, latitude and longitude, water temperature, set, and drift. If ice is sighted when the ice patrol is not in operation, the report should be addressed to the Hydrographic Office, United States Navy Department.

Reporting derelicts.—Reports regarding derelicts should be addressed to the Hydrographic Office, United States Navy Department, Washington, D. C., and prefixed *Hydro*.

TIME SIGNALS

The United States system of broadcasting **time signals,** as indicated in the table below, consists of the transmission of dashes (—) and the omission of dashes (0) for the seconds of the 5 minutes preceding the final time signal which is on the hour. The final time signal is the beginning of a much longer dash (——) than the others, being about 1.3 seconds duration. The number of dashes sounded in the group immediately preceding the four omissions at the end of the first four minutes of the signal, indicates the number of minutes of the signal yet to be sent. There are nine omissions before the final time signal. In all cases, the beginning of a second is on the beginning of a corresponding dash.

Minute intervals preceding hour	Seconds of minute intervals												
	1 to 28	29	30 to 50	51	52	53	54	55	56	57	58	59	60
55 to 56	Dash (—) every second 1 to 28 incl.	0	Dash (—) every second 30 to 50 incl.	0	—	—	—	—	0	0	0	0	—
56 to 57		0		—	0	—	—	—	0	0	0	0	—
57 to 58		0		—	—	0	—	—	0	0	0	0	—
58 to 59		0		—	—	—	0	—	0	0	0	0	—
59 to hour		0		0	0	0	0	0	0	0	0	0	—

NAVIGATIONAL WARNINGS

Radiotelegraphic navigational warnings affecting the waters of the United States and possessions are compiled by the United States Hydrographic Office, Navy Department; the United States Coast Guard; and the North Atlantic International Ice Patrol (U. S. Coast Guard vessel). These warnings contain information of importance to the safety of navigation, such as the position of ice, derelicts; also defects and changes in aids to navigation, mine fields, etc., which are later published in the Notice to Mariners. Navigational warnings are also available via radiotelephone.

Radiotelephone.—Transmission by voice of radio navigational warnings is made immediately after the regular "radiotelephonic broadcast of weather information" by the same stations, following the same schedule and method of procedure.

These radiophone warnings contain the latest reports of local changes in aids to navigation such as are later published in the Notice to Mariners and the late and more

important reports of obstructions to navigation in nearby waters as received from the Hydrographic Office of the United States Navy and local sources.

Complete details relative to radio telephonic or telegraphic navigational warnings are given in *Radio Weather Aids to Navigation* (H. O. 206).

SHIPS IN DISTRESS

Radio-equipped vessels requiring assistance may obtain the services of the Coast Guard by transmitting a request on the international distress and calling frequency 500 kilocycles to "Any Coast Guard Unit" (radio call NCU), or to any shore radio station addressed to "COGUARD". Shore radio stations will forward to the Coast Guard all information regarding vessels requiring assistance unless such information is contained in a message specifically addressed elsewhere.

If the following information is included in the original request for assistance it will place the responsible Coast Guard officer in a position to determine immediately the types and number of vessels required to render adequate aid; thus greatly facilitating the work of the Coast Guard and avoiding any unnecessary delay in the dispatching of assistance.

1. Name, type, and nationality of vessel.
2. Position, course, and speed (including drift).
3. Nature of trouble and condition of vessel, sea, and wind.
4. Number of persons on board.
5. State whether or not Coast Guard assistance is required.

Small craft in distress.—Under the provision of the international regulations, which permit the use of any means available to a vessel or aircraft in distress to draw attention and obtain help, small commercial and private craft equipped with radiotelegraph or radiotelephone apparatus that cannot be operated on the international distress frequency of 500 kc. (600 m.) may usually obtain United States Coast Guard assistance by transmitting the distress signal or call and the message on the 2670 kc. (112 m.) frequency. Practically all Coast Guard units maintain a continuous watch on 2670 kc. (112 m.) and will answer emergency calls thereon, if heard.

Medical advice by radio.—Arrangements are made in various countries whereby mariners of all nationalities may obtain medical advice by radio. In the United States and its possessions free medical advice is obtainable through Government and commercial radio stations of its mobile service. The advice is given in language intelligible to the layman.

RADIO BEARINGS

Accuracy of radiobeacon bearings.—No exact data can be given as to the accuracy to be expected in radio bearings taken by a ship, since the accuracy depends to a large extent upon the skill of the ship's operator, the condition of the ship's equipment, and the accuracy of the ship's calibration curve. Mariners are urged to obtain this information for themselves by taking frequent radio bearings when their ship's position is accurately known, and by recording the results. United States radiobeacons are operated on hourly schedules regardless of weather conditions and at other times upon request (see special operation of radiobeacon stations given in Light Lists), giving mariners opportunity to make such frequent observations, and often to check the results directly with visual bearings.

Skill in the operation of the radio direction-finder can be obtained only by practice and by observing the technical instructions for the set in question. For these reasons

the operator should study carefully the instructions issued with the set and should practice taking bearings frequently so that when bearings are needed he can obtain them rapidly and accurately.

As the operator obtains bearings by revolving the direction-finder coil until the signal disappears or becomes a minimum, the operator can tell by the size of the arc of silence or of minimum strength approximately how accurately he has taken the bearing. For instance, if the minimum is broad and the residual signal covers about 10° with equal strength, it is doubtful if the bearing can be accurately estimated within 3° or 4°. Where direction-finder bearings are not taken by the navigating officer, it will frequently be advantageous for the mariner to have his ship's operator report the probable operator's error of the bearing taken.

Directional radiobeacons transmit radio waves in beams along fixed bearings (sometimes called radio ranges). These beacons are used to guide aircraft, but are not at the present time suitable for use by surface ships due to the relatively wide sector covered by the beams.

Radio bearings from other vessels.—Any vessel with a radio direction-finder can give a bearing to a vessel equipped with a radio transmitter. Such service will generally be furnished when requested, particularly by Government vessels. These bearings, however, should be used only as a check, as comparatively large errors may be introduced by local conditions surrounding the radio direction-finder unless known and accounted for. Any radio station, the position of the transmitter of which is definitely known, may service as a radiobeacon for vessels equipped with a radio direction-finder. However, mariners are cautioned that stations established especially for maritime service are more reliable and safer for use by the mariner, for numerous reasons.

Many navigators are using the ship's radio direction-finder as a help in avoiding collision in fog, detecting with it the presence and observing the direction of approaching vessels.

Caution, when taking radio bearings from a ship one should be careful to take the bearing when the vessel is on an even keel. Large errors may be introduced if the vessel is listed when the bearing is taken.

Conversion of radio bearings to Mercator bearings.—The increasing use of radio directional bearings for locations of ships' positions at sea, especially during foggy weather, has made it particularly desirable to be able to apply these radio bearings (taken on shipboard or sent out by the shore stations) directly to the nautical chart. These radio bearings are the bearings of the great circles passing through the radio stations and the ship, and, unless in the plane of the Equator or of a meridian, would be represented on a Mercator chart as curved lines. Obviously it is impracticable for a navigator to plot such lines on a Mercator chart, so it is necessary to apply a correction to a radio bearing to convert it into a Mercator bearing, that is, the bearing of a straight line on a Mercator chart laid off from the sending station and passing through the receiving station.

On page 26 a table of corrections is given for the conversion of a radio bearing into a Mercator bearing. It is sufficiently accurate for practical purposes for distances up to 1,000 miles.

The only data required are the latitudes and longitudes of the radiobeacons or radio direction-finder station receiver or transmitter, and of the ship by dead reckoning. The latter is scaled from the chart, and the former either scaled from the chart or taken from the list of radiobeacon and radio direction-finder stations found in *Radio Navigational Aids* (H. O. 205).

The table is entered with the differences of longitude in degrees between the ship and station (the nearest tabulated value being used), and opposite the middle latitude between the ship and station, the correction to be applied is read.

When bearings are taken from the ship, the sign of the correction (bearings read clockwise from the north) will be as follows: In north latitude, the minus sign is used when the ship is east of the radiobeacon and the plus sign used when the ship is west of the radiobeacon. In south latitude, the plus sign is used when the ship is east of the radiobeacon, and the minus sign is used when the ship is west of the radiobeacon.

To facilitate plotting, 180 degrees should be added to the corrected bearing, and the result plotted from the radiobeacon.

Should the position by dead reckoning differ greatly from the true position of the ship as determined by plotting the corrected bearings, a retrial should be made, using the new value as the position of the ship.

When the bearing is from a radio direction-finder shore station, the sign of the correction will be reversed to that given when the bearing is taken from the ship, and the position of the radio direction-finder station receiver is used in plotting the bearing.

Example.—A ship in latitude 39°51′ N., longitude 67°35′ W., by dead reckoning, obtains a radio bearing of 299° true on the radiobeacon located in latitude 40°37′ N., and longitude 69°37′ W.

Radiobeacon station	Latitude	40°37′ N.
Dead reckoning position of ship	Latitude	39°51′
Middle latitude		40°14′
Radio station	Longitude	69°37′ W.
Dead reckoning position of ship	Longitude	67°35′
Longitude difference		2°02′

Entering the table with difference of longitude equals 2°, which is the nearest tabulated value, and opposite 40° middle latitude, the correction of 39′ is read.

The ship being east of the radiobeacon, the correction is minus. The Mercator bearing will then be 299°−0°39′=298°21′. To facilitate plotting, add 180° and plot from the position of the radiobeacon, the bearing 298°21′+180° or 478°21′ or 118°21′ (Mercator bearing reckoned clockwise from north true).

Table of corrections, in minutes

[DIFFERENCE OF LONGITUDE IN DEGREES]

Mid. L.	½°	1°	1½°	2°	2½°	3°	3½°	4°	4½°	5°	5½°	6°	6½°	7°	7½°	8°	8½°	9°	9½°	10°
15°	4	8	12	16	19	23	27	31	35	40	43	47	50	54	58	62	66	70	74	78
16°	4	8	12	17	21	25	29	33	37	41	45	50	54	58	62	66	70	74	79	83
17°	4	9	13	18	22	26	31	35	39	44	48	53	57	61	66	70	75	79	83	88
18°	5	9	13	19	23	28	32	37	42	46	51	56	60	65	70	74	79	83	88	93
19°	5	10	15	20	24	29	34	39	44	49	54	59	63	68	73	78	83	88	93	98
20°	5	10	15	21	26	31	36	41	46	51	56	62	67	72	77	82	87	92	98	103
21°	5	11	16	21	27	32	38	43	48	54	59	64	70	75	81	86	91	97	102	108
22°	6	11	17	22	28	34	39	45	51	56	62	67	73	79	84	90	96	101	107	112
23°	6	12	18	23	29	35	41	47	53	59	64	70	76	82	88	94	100	105	111	117
24°	6	12	18	24	31	37	43	49	55	61	67	73	79	85	92	98	104	110	116	122
25°	6	13	19	25	32	38	44	51	57	63	70	76	82	89	95	101	108	114	120	127
26°	7	13	20	26	33	39	46	53	59	66	72	79	85	92	99	105	112	118	125	131
27°	7	14	20	27	34	41	48	54	61	68	75	82	89	95	102	109	116	123	129	136
28°	7	14	21	28	35	42	49	56	63	70	77	84	92	99	106	113	120	127	134	141
29°	7	15	21	29	36	44	51	58	65	73	80	87	95	102	109	116	124	131	138	145
30°	7	15	22	30	38	45	53	60	68	75	83	90	98	105	113	120	127	135	143	150
31°	8	15	23	31	39	46	54	62	70	77	85	93	100	108	116	124	131	139	147	155
32°	8	16	24	32	40	48	56	64	72	79	87	95	103	111	119	127	135	143	151	159
33°	8	16	25	33	41	49	57	65	74	82	90	98	106	114	123	131	139	147	155	163
34°	8	17	25	34	42	50	59	67	75	84	92	101	109	117	126	134	143	151	159	168
35°	9	17	26	34	43	52	60	69	77	86	95	103	112	120	129	138	146	155	163	172
36°	9	18	26	35	44	53	62	71	79	88	97	106	115	123	132	141	150	159	168	176
37°	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135	144	153	163	172	181
38°	9	18	28	37	46	55	65	74	83	92	102	111	120	129	139	148	157	166	175	185
39°	9	19	28	38	47	57	66	75	85	94	104	113	123	132	142	151	160	170	179	189
40°	10	19	29	39	48	58	68	77	87	96	106	116	125	135	145	154	164	174	183	193
41°	10	20	30	39	49	59	69	79	89	98	108	118	128	138	148	157	167	177	187	197
42°	10	20	30	40	50	60	70	80	90	100	110	120	130	140	151	161	171	181	191	201
43°	10	20	31	41	51	61	72	82	92	102	113	123	133	143	153	164	174	184	194	205
44°	10	21	31	42	52	63	73	83	94	104	115	125	135	146	156	167	177	188	198	208
45°	11	21	32	42	53	64	74	85	95	106	117	127	138	149	159	170	180	191	201	212
46°	11	22	32	43	54	65	76	86	97	108	119	129	140	151	162	173	183	194	205	216
47°	11	22	33	44	55	66	77	88	99	110	121	132	143	154	165	176	186	197	208	219
48°	11	22	33	45	56	67	78	89	100	111	123	134	145	156	167	178	190	201	212	223
49°	11	23	34	45	57	68	79	91	102	113	125	136	147	158	170	181	192	204	215	226
50°	11	23	34	46	57	69	80	92	103	115	126	138	149	161	172	184	195	207	218	230
51°	12	23	35	47	58	70	82	93	105	117	128	140	152	163	175	186	198	210	221	233
52°	12	24	35	47	59	71	83	95	106	118	130	142	154	165	177	189	201	213	225	236
53°	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	240
54°	12	24	36	49	61	73	85	97	109	121	133	146	158	170	182	194	206	218	231	243
55°	12	25	37	49	61	74	86	98	111	123	135	147	160	172	184	197	209	221	233	246
56°	12	25	37	50	62	75	87	100	112	124	137	149	162	174	187	199	211	224	236	249
57°	13	25	38	50	63	75	88	101	113	126	138	151	164	176	189	201	214	226	239	252
58°	13	25	38	51	64	76	89	102	115	127	140	153	165	178	191	204	216	229	242	254
59°	13	26	39	51	64	77	90	103	116	129	141	154	167	180	193	206	219	231	244	257
60°	13	26	39	52	65	78	91	104	117	130	143	156	169	182	195	208	221	234	247	260

PUBLICATIONS

The following résumé of the United States Government publications of navigational value is included for the ready reference of the mariner:

The Catalog of the United States Coast and Geodetic Survey Nautical Charts, Coast Pilots, Tide Tables, Current Tables, Tidal Current Charts, and Aeronautical Charts is distributed free by the United States Coast and Geodetic Survey and its authorized agents.

The List of Publications of the Department of Commerce lists the publications of the United States Coast and Geodetic Survey and may be secured free on application from the offices of the Department of Commerce and its field agencies, or from the Superintendent of Documents, Government Printing Office, Washington, D. C.

Certain libraries have been designated by the Congress of the United States to receive prints, as issued, of all publications printed by the Government for public distribution. These publications may be consulted by anyone during business hours.

NAUTICAL CHARTS

Coasts of the United States, Territories, and Possessions:
Issued by the United States Coast and Geodetic Survey.
For sale by the United States Coast and Goedetic Survey, Washington, D. C., district offices of the United States Coast and Geodetic Survey, and authorized sales agents in the various ports.

Mississippi River from the Head of Passes to Cairo:
Issued and for sale by the Mississippi River Commission, Vicksburg, Mississippi.

Illinois Waterway System:
Issued and for sale by the United States Engineers, Chicago, Illinois.

Ohio River:
Issued and for sale by the United States Engineers, Cincinnati, Ohio.

Great Lakes, Lake Champlain, New York State Canals, and the St. Lawrence River, St. Regis to Cornwall, Canada:
Issued and for sale by the United States Lake Survey, Detroit, Michigan.

New York State Canal System:
Issued and for sale by the Superintendent of Public Works, Albany, New York.

Foreign countries:
Issued by the Hydrographic Office, United States Navy Department.
For sale by the Hydrographic Office, Washington, D. C., and authorized sales agents in the various ports.

COAST PILOTS

Coasts of the United States, Territories, and Possessions:
Published by the United States Coast and Geodetic Survey.
For sale by the United States Coast and Geodetic Survey, Washington, D. C., district offices of the United States Coast and Geodetic Survey, and authorized sales agents in the various ports.

Foreign countries:
Published by the Hydrographic Office, United States Navy Department.
For sale by the Hydrographic Office, Washington, D. C., and authorized sales agents in the various ports.

TIDE TABLES

Atlantic Ocean, and Pacific and Indian Oceans—Two volumes:
Published by the United States Coast and Geodetic Survey.
For sale by the United States Coast and Geodetic Survey, Washington, D. C., district offices of the United States Coast and Geodetic Survey, and authorized sales agents in the various ports.

CURRENT TABLES

Atlantic Coast, North America, and Pacific Coast, North America, and Philippine Islands—Two volumes:
Published by the United States Coast and Geodetic Survey.
For sale by the United States Coast and Geodetic Survey, Washington, D. C., district offices of the United States Coast and Geodetic Survey, and authorized sales agents in the various ports.

TIDAL CURRENT CHARTS

Boston Harbor, Narragansett Bay to Nantucket Sound, Long Island and Block Island Sounds, New York Harbor, San Francisco Bay—Five volumes:
Published by the United States Coast and Geodetic Survey.
For sale by the United States Coast and Geodetic Survey, Washington, D. C., or its agents.

NOTICE TO MARINERS

Notices to Mariners are published weekly and may be secured free of charge from the United States Hydrographic Office.

Notice to Mariners, Philippine Islands, is compiled quarterly by the United States Coast and Geodetic Survey and may be secured free of charge from the United States Coast and Geodetic Survey, Washington, D. C., or Manila, P. I., Pacific Coast district offices of the United States Coast and Geodetic Survey, and authorized sales agents in the various Philippine ports.

LIGHT LISTS

North Atlantic Coast, South Atlantic Coast, Intracoastal Waterway, Pacific Coast:
Published by the United States Coast Guard.
For sale by the Superintendent of Documents, Washington, D. C., and by authorized sales agents in the various ports.

Philippine Islands:
Published by the Department of Finance, Bureau of Customs, Manila, Philippine Islands.
Copies of the List of Lights, Buoys, Beacons, and Daymarks of the Philippine Islands may be secured free on application to the Insular Collector of Customs, Manila, P. I.
A limited number of Philippine Notice to Mariners and List of Lights, etc., are available for free distribution at the Coast and Geodetic Survey district offices at Seattle, Wash., San Francisco, Calif., Los Angeles, Calif., and Honolulu, T. H.

Foreign Countries:
Published by the Hydrographic Office, United States Navy Department.
For sale by the Hydrographic Office, Washington, D. C., and authorized sales agents in the various ports.

RADIO

Charts of Radiobeacon System, Atlantic and Gulf Coasts, Pacific Coast, and Great Lakes:
Free on application to the United States Coast Guard.

Radio Circular No. 1, Distribution of Weather Information by Radio:
Free on application to the Weather Bureau, United States Department of Commerce, Washington, D. C.

Radio Navigational Aids (H. O. Pub. No. 205).
Radio Weather Aids to Navigation (H. O. Pub. No. 206).
Published by the Hydrographic Office, United States Navy Department.
For sale by the Hydrographic Office, Washington, D. C., and authorized sales agents in the various ports.

List of radiobeacons:
See Light Lists published by the United States Coast Guard.

Hydrographic Bulletin:
Issued weekly by the United States Hydrographic Office.

International Code of Signals (American Edition) Vol. II (Radio):
For sale by United States Hydrographic Office.

International Convention for the Safety of Life at Sea, London, 1929 (affecting radio), Extracts From:
May be obtained from Federal Communications Commission, Washington, D. C.

Communications Act of 1934:
For sale by Superintendent of Documents, Washington, D. C.

Ship Radio Telegraph Safety Rules:
From the Commission or the Superintendent of Documents.

The International Bureau of Telecommunication Union, Berne, Switzerland, publishes and sells the following:

1. List of Frequencies.
2. List of Coast Stations and Ship Stations.
3. List of Aircraft and Aeronautical Stations.
4. List of Broadcasting Stations.
5. List of Stations Performing Special Services.
6. List of Call Letters of Fixed Land and Mobile Stations.
7. List of Fixed Stations.
8. The Telegraph Rates.

Radio Service Bulletin:
Issued by United States Federal Communications Commission.

MISCELLANEOUS

American Practical Navigator (Bowditch):
Published by the Hydragraphic Office, United States Navy Department.
For sale by the Hydrographic Office and the Superintendent of Documents, Washington, D. C., and their agents.

Annual Report of the Chief of Engineers, United States Army:
Part 1.—Report upon river and harbor improvement work, including flood-control operations.
Part 2.—Commercial Statistics, Water-borne Commerce of the United States.
These volumes may be consulted at the libraries which are public depositories.
General Rules and Regulations Prescribed by the Board of Supervising Inspectors—four volumes:
Published by and issued free on application to the Coast Guard, Washington, D. C.
Laws Governing Steamboat Inspection:
Published by and free on application to the Coast Guard, Washington, D. C.
List of Bridges Over the Navigable Waters of the United States:
Published by the United States Engineers.
For sale by the Superintendent of Documents, Washington, D. C.
Navigation Laws of the United States:
Published by the Coast Guard.
For sale by the Superintendent of Documents, Washington, D. C.
Pilot Rules for Certain Inland Waters of Atlantic and Pacific Coasts and Coast of Gulf of Mexico:
Published by and free on application to the Coast Guard, Washington, D. C.
Pilot Rules for Rivers whose Waters Flow into the Gulf of Mexico and Their Tributaries and Red River of North:
Published by and free on application to the Coast Guard, Washington, D. C.
Pilot Rules for Great Lakes and Their Connecting and Tributary Waters:
Published by and free on application to the Coast Guard, Washington, D. C.
Port and Terminal Charges at United States Ports:
Prepared by the Board of Engineers for Rivers and Harbors, War Department, in cooperation with the United States Maritime Commission.
For sale by the Superintendent of Documents, Washington, D. C.
Port Series—of the United States—25 volumes:
Prepared by the Board of Engineers for Rivers and Harbors, War Department, in cooperation with the United States Maritime Commission.
For sale by the Superintendent of Documents, Washington, D. C.
Rules and Regulations; The Navigable Waters of the United States:
Prepared by the United States Engineers.
Shipping Charges at United States and Foreign Ports; Consular Services and Charges:
Prepared by the Board of Engineers for Rivers and Harbors, War Department, in cooperation with the United States Maritime Commission.
For sale by the Superintendent of Documents, Washington, D. C.
The American Ephemeris and Nautical Almanac:
Published by the United States Naval Observatory.
For sale by the Superintendent of Documents, Washington, D. C., and by authorized agents in the various ports.

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Chapter 2.—LOCAL GENERAL INFORMATION

DESCRIPTION

This volume covers the western coast of the United States between the Mexican boundary on the south and the international boundary between British Columbia and the United States on the north, including the Strait of Juan de Fuca and tributary waters within those limits.

The coast, as a rule, is rugged and mountainous, the high land in many places rising abruptly from the sea. Southward of San Francisco Bay the mountains are usually bare or covered with chaparral and underbrush. Northward of San Francisco Bay they are generally well timbered, and in some places, especially northward of the Columbia River, the timber is particularly dense and heavy.

There are few outlying dangers and they are described under separate headings in their appropriate place in the detailed description of the coast. The islands off the southern coast of California are the largest and most prominent and, except the Farallons, the farthest offshore of any along the coast.

The depths in approaching the coast are too great for a vessel, that is not equipped with an echo sounding instrument, to readily obtain soundings until within a short distance of the shores; the slope from the 100-fathom curve to greater depths is very abrupt, as is the case in many places from the 30-fathom curve to 100 fathoms. The 100-fathom curve lies at an average distance of less than 10 miles offshore, but this distance is increased in several cases, as in approaching San Francisco Bay, in the vicinity of Heceta Bank, off the mouth of the Columbia River, and at the entrance to the Strait of Juan de Fuca. In thick weather the greatest caution should be exercised and soundings taken frequently. See Coastwise Navigation, page 37.

Kelp grows on nearly every danger having having a rocky bottom and is particularly heavy at various points in the Santa Barbara Channel and in the vicinity of San Diego Bay. It will be seen on the surface of the water during the summer and autumn months; during the winter and spring it is not always to be seen, especially where it is exposed to a heavy sea. *Kelp should always be considered a sign of danger and no vessel should pass through it unless the spot has been carefully examined and sounded.* There are, however, many rocks not marked by it; a heavy sea will occasionally tear the kelp away from rocks, and a moderate current will draw it under water so that it will not be seen. When passing on the side of a patch of kelp from which the stems stream away with the current, care should be taken to give it a good berth. Dead, detached kelp floats on the water curled in masses, while live kelp, attached to rocks, streams away level with the surface.

Anchorage, affording shelter from the severe northwesterly winds of summer, may be had in a number of places along the coast. In southeasterly and southwesterly weather there are few places where shelter may be had; San Diego Bay, Los Angeles Harbor, the lee side of the islands off the southern coast, and Monterey Bay are the only places south of San Francisco Bay. North of San Francisco, Humboldt Bay, Coos Bay, Tillamook Bay, Columbia River, Willapa Bay, and Grays Harbor afford good shelter,

but most of these places must be made before the sea rises, as afterwards the bars become impassable. Neah Bay, just inside the entrance to the Strait of Juan de Fuca, is used considerably by vessels in westerly or southerly weather.

Aids to navigation.—These are numerous, and there are few places along the coast where a vessel is not in sight of one or more lights. Lightships are placed off: San Francisco Entrance, Blunts Reef near Cape Mendocino, the mouth of the Columbia River, Umatilla Reef, and Swiftsure Bank off the entrance to the Strait of Juan de Fuca. The dangers are buoyed as a rule and generally marked by kelp. The buoyage accords with the system adopted in United States waters. The lightships and principal coast lights are described in the text of this volume. For a complete description of all lighted aids, buoys, and daymarks see the *Light List, Pacific Coast of the United States,* sold by the Superintendent of Documents, Government Printing Office, Washington, D. C.

All lightships and some light stations are equipped with radio-beacons and there are numerous radio direction-finder stations located along the coasts and particularly in the vicinity of the entrances to the main ports. See list in Appendix.

Rules of the Road.—*Pilot Rules for certain inland waters of the Atlantic and Pacific Coasts and of the Coast of the Gulf of Mexico,* apply to the inland waters of the Pacific coast of the United States and of Alaska, as defined under the "General Rule".

General Rule.—At all buoyed entrances from seaward, to bays, sounds, rivers, or other estuaries, for which specific lines have not been described, Inland Rules shall apply inshore to a line approximately parallel with the general trend of the shore drawn through the outermost buoy or other aid to navigation of any system of aids.

The International Rules govern in Canadian waters.

TIDES

A very important characteristic of the tides on the western coast of the United States is the large inequality in the heights of the two high waters and of the two low waters of each day. On the outer coast the average difference between the heights of the two high waters of the day is from 1 to 2 feet, and the average difference in the heights of the two low waters from 2 to 3 feet. It was because of this large difference in the low-water heights that the mean of the lower low waters, rather than the mean of all low waters, was adopted as the plane of reference for the charts of this region.

This inequality changes with the declination of the moon. When the moon is near the Equator the inequality is relatively small; but when the moon is near its greatest north or south declination, the difference in the heights of the two high waters or of the two low waters of each day reaches a maximum. The tides at this time are called "Tropic tides."

Off the **outer coast** the mean rise of the tide above the plane of reference varies from 5 feet off southern California to about 7½ feet off the coast of Washington. Extreme variations from 3 feet below to 10 feet above the datum may reasonably be expected.

At the entrance to **San Francisco Bay** the mean rise of the tide is about 5 feet above the plane of reference. At the southern end of the bay the tide occurs about 1½ hours later, and the mean rise is about 2½ feet greater than at the entrance to the bay. Passing northward into **San Pablo Bay,** the tide occurs from 1 to 2 hours later than at the Golden Gate, with a mean rise of about ½ foot greater than at the latter place. In **Suisun Bay** the time of tide is about 3 hours later than at the Golden Gate, with a mean rise about the same. It requires about 4 hours for high water to pass from Suisun Bay

to Stockton, on the San Joaquin River, and about 5 hours from Suisun Bay to Sacramento, on the Sacramento River. The mean rise of the tide above the plane of reference at Stockton is about 3½ feet and at Sacramento about 2½ feet.

In **Humboldt Bay** the tide is from ½ to 1 hour later than on the outer coast. The mean rise is about 6 feet above the plane of reference.

In **Coos Bay** the tide is from ½ to 1½ hours later, and the rise of high water about the same as in Humboldt Bay.

In **Yaquina Bay** the mean rise is about 7 feet above the plane of reference.

At the entrance to the **Columbia River** the mean rise is about 7½ feet above the plane of reference. It requires about 6 hours for high water to pass from the entrance to the Columbia River to the mouth of the Willamette River. In passing up the Columbia River the range of tide decreases until it is only about 1½ feet at the mouth of the Willamette. Above this point the tidal range becomes too small to be of practical importance. There are, however, large fluctuations in the level due to meteorological conditions. An extreme variation of 24½ feet has been noted at St. Johns on the Willamette River. The river is usually highest during the months of May, June, and July, and lowest during the months of September, October, and November.

In **Willapa Bay** and in **Grays Harbor** the mean rise is about 9 feet above the plane of reference.

Passing through the **Strait of Juan de Fuca,** the tide occurs about 4 hours later at Port Townsend than at Cape Flattery. The mean rise increases from 7 feet above the datum at Cape Flattery to 7½ feet at Port Townsend. There is an increase in the average inequality between the two low waters of each day from 3 feet at Cape Flattery to 5 feet at Port Townsend. The average inequality between the two high waters of each day at both places is about 1½ feet.

In **Puget Sound** the tide is about ½ to 1 hour later than at Port Townsend. The mean rise increases from 7½ feet above the datum of mean lower low water at Port Townsend to 13½ feet at Olympia. In Puget Sound the average difference between the two low waters of each day is 6 feet. At Seattle an extreme range from 4½ feet below the datum of mean lower low water to 15 feet above the same datum has been observed. At Olympia, in the southern part of the sound, an extreme high water 18 feet above the datum has been noted.

In **San Juan Archipelago** the mean rise of the tide varies from 6½ to 8 feet above the plane of reference. An extreme range from 4½ feet below the plane of reference to 12 feet above the same datum may reasonably be expected.

Caution.—In using the Tide Tables, slack water should not be confused with high or low water. For ocean stations there is usually but little difference between the time of high or low water and the beginning of ebb or flood currents; but for places in narrow channels, landlocked harbors, or on tidal rivers the time of slack current may differ by several hours from the time of high or low water stand. The relation of the times of high and low water to the turning of the current depends upon a number of factors, hence no simple nor general rule can be given. To obtain the times of slack water or strength of current, reference should be made either to figures given for various places in this volume of the Coast Pilot or to the *Pacific Coast Current Tables*.

CURRENTS

An offshore current with an estimated width of 200 to 300 miles or more flows nearly south-southeastward, following the trend of the coast, from about 50° north to

Point Conception, where it bends southward and westward. The estimated velocity is about ¼ knot, but this is largely influenced by prevailing winds; prevailing northerly winds increasing its velocity and southerly winds diminishing it.

Generally speaking, the offshore currents set southerly throughout the year, but during the autumn months, north of the forty-fifth parallel, the set is easterly.

Except in northerly winds a weak northerly setting current will generally exist close inshore known as the **Davidson Inshore Current.** This is especially noticeable at Swiftsure Bank Lightship and along the southwestern coast of Vancouver Island, setting in a northwesterly direction. (See Caution note on page 46.)

This current, increased in width, extends southward as far as San Diego in the winter months when the prevailing wind is southerly, but in other seasons of the year there is little evidence of it except on the coast of Washington, where it exists on southerly winds and sometimes on winds from other quarters at all seasons of the year.

CURRENTS AT LIGHTSHIPS

Current observations have been made at San Francisco, Blunts Reef, Columbia River, Umatilla Reef, and Swiftsure Bank Lightships. In general it may be said these observations show that on the average winds here bring about a current having a velocity 2 percent that of the wind, the direction of this wind-driven current being about 20° to the right of the wind with winds from the northeast, southeast, and northwest quadrants, and about 20° to the left of the wind with winds from the southwest quadrant. Because wind currents frequently depend on a previous wind or a wind blowing elsewhere, they differ at times widely from the average condition. The largest measured current velocity at each lightship was in the neighborhood of 3 knots. A summary of the results of the current observations at each of the lightships is given below.

SAN FRANCISCO LIGHTSHIP

Tidal current.—The tidal current here is rotary, turning clockwise, and is largely diurnal, that is, revolving in a period of about 25 hours. At strength the current has a velocity averaging less than ½ knot, setting southeastward about an hour before higher low water at San Francisco, and northwestward about 2 hours after lower low water.

Nontidal current.—During the winter months there is a nontidal current with an average velocity of about ¼ knot, setting northwesterly. During the summer months this nontidal current is weaker, averaging about ⅒ knot, the direction being variable and frequently southerly. The direction and velocity of the nontidal current is very considerably modified by the wind.

Wind current.—In general the velocity of the wind current is about 2 percent that of the wind, but currents accompanying winds from the southeast quadrant are stronger than the average, while the currents accompanying winds from the northwest quadrant are weaker than the average.

BLUNTS REEF LIGHTSHIP

Tidal current.—The tidal current at this lightship is weak, having at strength a velocity of less than ¼ knot. It is therefore completely masked by nontidal currents due chiefly to the wind.

Nontidal current.—The nontidal current here has a velocity averaging about ¼ knot, setting southwesterly. During the winter months the wind is prevailing from the southeast and during these months the nontidal current sets northwesterly.

Wind current.—The observations bring out the fact that here the current velocity due to a wind of given strength, is practically the same for all directions of the wind, the velocity of the current being about 2 percent that of the wind. The direction of the wind-driven current obeys the general rule for this coast that winds from the northeast, southeast, and northwest quadrants bring about currents the directions of which are about 20° to the right of the wind, while winds from the southwest quadrant bring about currents setting about 20° to the left of the wind.

COLUMBIA RIVER LIGHTSHIP

Tidal current.—The tidal current at Columbia River Lightship is of the rotary type with a velocity at strength of flood or ebb of ¼ knot. This tidal current, however, is completely masked by nontidal currents due to river discharge and winds.

Nontidal current.—At Columbia River Lightship there is a nontidal current averaging ⅓ knot with a set to the west-southwestward. This nontidal current is due largely to the discharge from the Columbia River and therefore varies with the seasons. It is greatest during the summer months, averaging then more than ½ knot. The direction of the nontidal current is also subject to a seasonal variation, setting southwesterly in the spring and summer months and northwesterly in the fall and winter months. This variation in direction is due to the winds.

Wind current.—Along this part of the coast the wind is prevailingly from the northwest in the spring and summer months and from the east and southeast during the fall and winter months. Because of the nontidal current due to river discharge, the direction of which is west-southwest, northerly winds are accompanied by stronger currents than southerly winds. Except for the influence of the river current the general rule holds good that the velocity of the current is about 2 percent that of the wind and that winds from the northeast, southeast, and northwest quadrants bring about currents that set about 20° to the right of the wind, while the currents accompanying winds from the southwest quadrant set about 20° to the left of the wind.

UMATILLA REEF LIGHTSHIP

Tidal current.—The tidal current here is only slightly rotary, setting N. 15° W. on the flood and S. 15° E. on the ebb with a velocity at strength of about ⅓ knot.

Nontidal current.—The nontidal current at Umatilla Reef Lightship shows a very distinct seasonal variation. During the winter months this current sets northward with a velocity which averages ⅔ knot, while in summer it sets southward with a velocity of about ⅓ knot.

Wind current.—Here the prevailing wind is from the east and southeast in winter and from the west and northwest in summer. The southerly winds bring about stronger currents than the northerly winds, the current with the southerly winds being about 3 percent of the wind, while with the northerly winds the current is about 1½ percent that of the wind. The general rule for the deviation of the wind-driven current from the direction of the wind, namely, currents brought about by winds from the northeast, southeast, and northwest quadrants set about 20° to the right of the wind, while with winds from the southwest quadrant the current sets about 20° to the left of the wind, is applicable here.

SWIFTSURE BANK LIGHTSHIP

Tidal current.—At this lightship, the tidal current is distinctly rotary, turning clockwise. At strength of flood or ebb the current has a velocity of ¾ knot on the average. Strength of flood sets southeasterly and comes about 1½ hours after high water at Astoria; strength of ebb sets northwesterly and comes about 1 hour after low water at Astoria.

Nontidal current.—At Swiftsure Bank Lightship the nontidal current has a velocity averaging ½ knot, setting northwestward. This is due largely to the drainage waters flowing seaward through the Strait of Juan de Fuca. The velocity of the nontidal current is greatest during the fall and winter months when it averages somewhat more than ½ knot. This increase may be attributed to the heavy rainfall and the prevailing easterly winds during these seasons.

Wind current.—The prevailing wind here is from the east during the fall and winter months and from the west and southwest during spring and summer. Due to the northwesterly setting nontidal current arising from the discharge of the drainage waters through the Strait of Juan de Fuca, the strongest currents at Swiftsure Bank Lightship come with southeasterly winds and the weakest with northwesterly winds. The general rule for the deviation of the wind-driven current from the direction of the wind does not hold good here, not only because of the effect of the northwesterly setting nontidal current, but also because of the fact that the coast line here is to the north of the light vessel, while for the other light vessels it is to the east. In general, it may be said that winds from the southeastern quadrant here are accompanied by currents, having a velocity about 3 percent that of the wind, setting northwestward to north-northwestward. Winds from the northwestern quadrant are accompanied by currents, having velocities about 1 percent that of the wind, setting westward when the wind velocity is less than 30 miles per hour, and southeastward to southward when the wind velocity is greater than 30 miles per hour. Winds from the northeast are accompanied by westerly currents and winds from the southwest by northerly currents.

WEATHER

There are two seasons—the summer or dry season, which begins about May and continues until October, and the winter or rainy season, covering the remainder of the year. These seasons vary in length in different parts of the coast as well as in different years.

Along the southern part of the coast the rainy season is comparatively short and the rainfall much lighter than in the northern portion, being so light in some years as to cause considerable damage to stock and farming industries. The winter gales from southward and southwestward are less frequent and less severe than at more northern points. The temperatures are milder and more even, and the snowfall is limited to the higher mountain peaks.

Northward of San Francisco the rainy season increases in length and amount of rainfall, and as the Strait of Juan de Fuca is approached showers of short duration and generally local may be looked for at any time. Snow falls at rare occasions in San Francisco and vicinity, but is frequent and at times heavy in the vicinity of the Strait of Juan de Fuca. From San Francisco northward the winter gales increase in severity, frequency, and duration, while in summer the northerly and northwesterly winds at times reach almost hurricane strength.

Winds.—The prevailing winds in summer are from northwest and west, on the northern part of the coast; on the southern part, from west and southwest. The northwestern winds in summer frequently reach a velocity of 70 miles an hour and extend as far south as Point Conception, eastward of which their severity is much less. As a rule, the northwestern wind begins about sunrise and reaches its maximum velocity about 3 or 4 p. m., moderating toward sunset and dropping to light airs or calms by daylight. The severe northwesterly gales generally last two or three days, and continue throughout the night with little or no diminution.

In winter the heaviest weather is from southeast and southwest, with an occasional northerly gale of short duration. The southeasterly gale occurs at any time, generally accompanied by rain and thick weather, and increasing in severity northward. These gales, with the heavy southwesterly swell prevailing during the winter months, cause a confused, irregular sea that taxes the weatherly qualities of a vessel to the utmost. They spring up gradually from southward, and increase in strength, with a rapidly falling barometer. When the barometer becomes stationary, the wind shifts to southwest and blows heavily, with clearing weather and frequent rain squalls. The barometer rises when the wind hauls to the southwestward, from which point it generally blows from 12 to 20 hours.

When the southwesterly gale of winter is not preceded by southerly weather, the barometer seldom falls, but either remains stationary, when the gale may be expected to continue longer, or rises slowly, when it will gradually subside and fine weather follow.

Fog.—On the outside coast fogs are liable to occur at any time, but are more frequent in July, August, and September. On the southern part of the coast they are light and generally clear away by noon. In the northern parts of the coast they are more frequent and at times are very dense, and have been known to extend several hundred miles seaward. They continue at times for weeks, rendering navigation difficult, and frequently require considerable wind to dispel them. They are generally brought in toward sundown, from seaward, by light westerly winds, and ordinarily continue until noon of the following day and sometimes later.

The variation of the extent fog is present along the coast is shown by the following:

Los Angeles Harbor has an average of 424 hours of fog per year. Point Reyes, an important turning point for the navigator where coasting craft bound north or south change course, is one of the foggiest localities in the United States. The records show that in this vicinity there are about 1300 hours of fog per year and there is an average of 21 days of dense fog in the month of August. At the Columbia River Entrance there are about 634 hours of fog per year.

A table is given in the Appendix showing the number of hours of operation of the fog signals at many of the light stations on the Pacific Coast.

Fog Signals.—Sound is conveyed in a very capricious way through the atmosphere. Mariners should not judge their distance from a fog signal, by the force of the sound, nor assume that a fog signal is not sounding because they do not hear it. When nearing the land or danger in fog, sounding is generally the only safe guide and should be faithfully done.

NORTH PACIFIC WEATHER, BY MONTHS

January is usually a stormy month on the North Pacific Ocean. Brisk to high southeasterly winds may be expected, with gales often lasting for many days. An area of low pressure overlies the North Pacific and is more or less permanent in character. Numerous disturbances prevail on the Washington and Oregon coasts, sometimes moving southward over California, but more generally moving eastward or southeastward across the United States. Low tule fog occurs in the morning at the mouths of rivers and harbors.

February is also a stormy month. High northeasterly winds lasting for days may be expected north of Cape Flattery, while high southeasterly winds prevail southward to Point Conception. Rainfall is heavy and frequent from Cape Mendocino northward. A rapidly falling barometer with southeasterly winds is generally followed by several days of stormy weather.

March is a month of unsettled weather. Southerly winds frequently hauling to strong southwesterly winds may be expected. Occasionally disturbances will move northward from the California coast over Oregon and Washington. The rainfall is apt to be heavy along the coast north of Cape Blanco.

April is a month of showers. Fresh westerly winds, changing to brisk northwesterly, may be expected along the entire coast. Occasionally disturbances may be expected on the Oregon and Washington coasts, passing generally to the northeastward. The rainfall is less than in the preceding month.

May is as a rule a pleasant month. There are but few southeasterly gales. Northwesterly winds prevail north of Cape Mendocino. Occasionally high north to northwesterly winds blow steadily for several days along the coast. Gales are rare, and when they do occur are of moderate intensity.

June is as a rule a pleasant month. Areas of high pressure may move from the California coast northward through Oregon and Washington. Winds are as a rule from the west or northwest. Rainfall is scant south of Cape Mendocino. More or less fog prevails along the coast.

July is generally a pleasant month. High northwesterly winds prevail along the coast of Oregon and northern California. There is also much fog in the afternoon at the entrance to San Francisco Bay, and much fog prevails along the coast.

August is usually a quiet month. Storms are infrequent. Rainfall is very light along the coast, especially south of Cape Mendocino. Fogs are frequent on the Cali-

fornia coast. Strong north to northwesterly winds prevail along the entire coast. August averages the most fog of any month of the year.

September is a quiet month. Occasional storms occur toward the close of the month and rainfall is heavier on the Oregon and Washington coasts. The winds are generally from the northwest, and much low fog prevails close to the shore.

October marks the beginning of stormy weather. Occasional disturbances with high southeasterly gales may be expected from the Strait of Juan de Fuca south to Point Reyes. Rainfall is heavier and fog is less frequent except south of Cape Mendocino

November is a stormy month. Southeasterly gales are frequent, increasing in severity toward the close of the month. This month marks the beginning of the rainy season in California.

December is a stormy month. Southeasterly gales are frequent and winds from 40 to 60 miles an hour may occur with these storms. The rainfall is heavy along the entire coast. Low-lying fogs frequently occur in the morning along the coast, but are much less frequent than in summer.

SMOKE

Smoke from forest fires occurs during July, August, and September in Puget Sound and Georgia Strait and at times extends a considerable distance seaward, southward and northward of Cape Flattery. At times it is a serious hindrance to navigation and has been known to prevent it entirely in Puget Sound. In recent years its prevalence has considerably diminished, some seasons being entirely free from it. It is cleared away by rains.

COASTWISE NAVIGATION

Navigation along the coast of California, Oregon, and Washington presents to the mariner a problem of unusual difficulty. The courses in general are long and must be traversed during frequent periods of thick weather, with the vessel subject to the action of currents whose velocity and direction are uncertain.

The subject of fog in general is given on page 35, and a table of the operation of fog signals at various points is given in the appendix on page 379. A general statement on currents is given on page 32.

An inquiry into the subject of coastwise navigation, including interviews with navigators and a study of the investigations made by the Merchant Marine Inspection Service, Coast Guard, into the causes of strandings, indicates the following:

1. As a preliminary, it may be stated that the currents are frequently blamed for disasters for which they probably are in no way responsible. In a large percentage of the above strandings, total lack of knowledge of the compass deviation was the most striking fact brought out in the investigation. The course was shaped from the log of some previous voyage, and no one knew what the corresponding magnetic course might be.

The factors which cause deviation from the track are changing and uncertain. On no two voyages are they identical. Therefore, to rely blindly on a course merely because it was made good on some previous occasion is to invite certain ultimate disaster. Yet cases of this sort were so common as to justify special mention even in a publication which does not, as a rule, take into account the shortcomings of the navigator.

2. Although a knowledge of the compass error is essential, in thick weather the navigator should never rely on the compass alone. There are undoubtedly many periods when the currents are weak or nonexistant, and the magnetic course steered will be made good. But there is no way of telling when such periods occur. As a rule, navigators cannot count on making their courses and distances good, or assume that even though such courses lead, in general, from 6 to 10 miles off the nearest shores they have allowed an ample margin of safety. It is by no means uncommon for vessels to be set 10 or 12 miles off their courses in as many hours, and to have their speed made good, accelerated, or retarded by considerably greater amounts.

3. The majority of the strandings have occurred in foggy but comparatively calm weather. Indeed, considering the large number of strandings on record, it is surprising that the loss in lives and property has been so small. Various reasons may be advanced for the strandings, one of them undoubtedly being the failure of the navigator to realize that currents of considerable velocity are frequently encountered when there are no other unfavorable local conditions to warn him of their existence.

4. Current observations at lightships show that a wind-driven current usually sets in a direction somewhat to the right or left of the direction toward which the wind is blowing. See Currents at Lightships, pages 33 to 34. (See Caution note on page 46.)

5. In the majority of the cases where the strandings appear to have been directly due to currents, the currents have been against the vessel. Most of the strandings have happened to deeply laden, southbound vessels to the northward of the projecting points like Capes Blanco, Mendocino, and Arena. The consensus of opinion among the navigators of the coast is that the currents follow the curves of the shore. If this is true, a vessel southbound against a northerly current would experience a tendency to set in to the northward of the points and out to the southward of them. As a specific instance, one navigator states: "If you have seen Blanco and Northwest Seal Rocks and find you have been set off a little and the speed made good retarded some, then you can be sure you will be set in toward Mendocino, or if you have set in toward Seal Rocks and your speed has been accelerated, then you can be sure you will be set off on nearing Mendocino." The general configuration of the coast tends to support this theory. As already stated, wrecks to southbound vessels occur to the northward of Capes Blanco, Mendocino, and Arena. More northbound vessels have been lost in the vicinity of Punta Gorda than at any other point along the coast. It is in these localities that the deviation of the coast from its general north and south direction is greatest.

There is one serious objection to the theory that the currents follow the curves of the shore. It can readily be seen how a current flowing in a general north and south direction would be deflected to the westward by the points projecting in that direction, resulting in a tendency to set the vessel offshore; the set being experienced in approaching the point if traveling with the current, or after passing the point if traveling against the current. But it is difficult to conceive of any agency which could redeflect that current to the eastward after it had passed a point which had already caused it to swing off to the west, although such conditions would undoubtedly cause a local eddy current of considerable extent.

There are, however, some reasons for believing that the phenomena which have been observed are caused by currents which originate well offshore and flowing in strike the coast and are deflected to the north or south. This theory would explain the fact, already noted, that currents are so frequently encountered in relatively calm weather. It would also explain the fact that vessels have frequently experienced a considerable

set directly inshore caused by currents acting so squarely across the track that they had no effect on the speed made good. Sets of this character appear to be particularly frequent between Heceta Bank and Cape Arago, between Trinidad and Cape Mendocino, and off Monterey Bay.

Under the conditions above described, it is absolutely necessary to take soundings for safe navigation on this coast in thick weather. It is the method which has been relied upon by the men who have navigated the coast in safety for years; its neglect has contributed directly to the great majority of the strandings which have occurred.

In modern practice, the continuous chain of soundings obtained by a vessel, equipped with a reliable echo-sounding apparatus, will be found most useful in laying down on the chart the track made good by the vessel. Radio bearings greatly reduce the dangers incident to navigation but the use of these should not lead the navigator to neglect sounding.

The master must assume the possible existence of a current which is setting his ship into danger, and take his precautions accordingly. On vessels not equipped with a reliable echo-sounding apparatus, the vessel's progress should be verified by an occasional sounding on each course where the depths permit, and in approaching each important danger or turning point, soundings should be taken frequently for some time both before and after the change of course, unless in the meantime a reliable fix has been obtained. The soundings after the change are of the greatest value as revealing any error in the reckoning on which the change of course is based, and it may conservatively be stated that had such soundings been taken the great majority of the past disasters would have been prevented.

Navigation by means of soundings renders imperative a careful study of the chart. The navigator must learn what, for any given locality, are the critical characteristic features revealed by the bottom configuration which insure his safety or indicate the proximity to danger; what depths to follow and what to avoid; localities where soundings may be taken to advantage to obtain a check on the position; information revealed by the character of the bottom; and perhaps most important of all, as being the condition most likely to cause trouble even for the careful navigator, certain areas which duplicate the critical depths of the track, so that if the former were mistaken for the latter the result might be most serious. All these are items of the utmost importance.

Since the safety of all concerned must frequently depend on the soundings alone, it is essential that to the operation should be devoted a degree of skill and care commensurate with its importance. It is usually impossible for the master to give his personal attention to the task, but he should see that the man to whom he intrusts it is so carefully trained and so impressed with the importance of his duty that a mistake is next to impossible.

There is a method in common use on the coast of sounding without using pressure tubes, the depth being estimated from the amount of wire out. Such a method is perhaps justified for every other cast while feeling for the bottom as the vessel approaches soundings from deep water, but once the bottom has been picked up it should never be trusted. There are too many factors to be considered, and all of them uncertain and variable; the speed of the ship, the smoothness with which the reel is working, and, above all, the "personal equation" of the operator. He will be too much influenced by the depths which he thinks he should find. If he expects bottom in 30 fathoms he will pay out the wire so slowly that he probably will not find the bottom in a depth of 60 or 70 fathoms. If he expects 80 to 100 fathoms he may get bottom in 25 or 30 fathoms

and never know it. The records clearly show that this method of sounding has resulted in the loss of vessels through mistakes which could have not gone undetected if a tube had been used.

So, for every wire sounding taken while the ship is underway, a pressure tube should be used, and the lead should be armed to bring up a sample of the bottom. The amount of wire out should, of course, be reported, for that does give a general idea of the depth some moments before the tube can be reeled in. But this estimated depth should be verified by the tube and the sample of bottom obtained should be compared with that shown on the chart.

Finally, it is important to realize that under certain conditions pressure tubes are subject to considerable errors, with which the navigator must be familiar if he is to get full value for them. As commonly used they are not very reliable or accurate.

The value of an echo-sounding machine for sounding when underway, if the depths are too great for the handlead, cannot be overemphasized. If such equipment is not available some up-and-down soundings with the vessel stopped are essential to accuracy.

The introduction of radio direction-finder stations ashore, and of radio-compasses on board ship, have given the navigator additional ways of determining his position with a fair degree of accuracy, but sounding should never be neglected. A vessel equipped with an echo-sounding apparatus, may depend largely upon continuous soundings to furnish accurate information as to the vessel's position. Due to the fact that there are certain conditions under which radio bearings may be subjected to grave error, the additional check of sounding in critical places should be carried out. One of the worst disasters of recent years on the Pacific Coast was due in part to the erroneous interpretation of a radio bearing received from a shore station.

There are pinnacle rocks along the Pacific Coast extending sometimes considerable distances off the shoreline. The ordinary survey with the leadline cannot be relied on to locate all these rocks. The Coast and Geodetic Survey has swept some of the coast with the wiredrag, which is the only known method of detecting them. Vessels navigating close to shore to avoid the northwesterly winds of summer necessarily incur the danger of striking one of these uncharted pinnacles.

Wiredrag surveys have been completed, to 1941, along the coast in the following areas:

San Clemente Island; Santa Catalina Island; Avila to Point Pinos; Santa Cruz to Point San Pedro; Golden Gate; western half of Drakes Bay and about 10 miles north of Point Reyes; off the mouth of Gualala River; Iverson to southern jetty at the entrance to Humboldt Bay; Klamath River to 8 miles north of Point St. George; off the mouth of Chetco River; 11 miles south to 5 miles north of Cape Blanco.

The Coast Highway extends close along the shore in numerous places along the entire length of the Pacific coast. The navigator should take care not to confuse headlights of automobiles with aids to navigation.

Fishweirs.—Regulations prescribe that fishing structures and appliances in navigable waters of the United States shall be lighted for the safety of navigation, as follows:

The lights shall be displayed between sunset and sunrise. They shall be placed at each end of the structure excepting where the inner end terminates in such situation that there is no practicable navigation between it and the highwater line of the adjacent coast, in which case no inner light shall be displayed. The outer light shall be white and the inner light shall be red. The size, capacity, and manner of maintenance of the lights shall be such as may be specified in the War Department permit authorizing the erection of the structure or appliance.

When several structures or appliances are placed on one line with no navigable passage between them, they will be considered, for lighting purposes, as one structure.

LOCAL SERVICES

Pilots will be found cruising off the port of San Francisco. Pilots are available at most of the other ports, but do not cruise off the entrances. Vessels desiring pilots are urged to radio ahead, and state probable time of arrival off the entrance. Extracts from the laws governing pilotage will be found under the headings of the various localities.

Towboats are available at all the principal ports, but as a rule no longer cruise off the entrances. Arrangements for towboats should be made by radio or telegraph.

Captains of Ports are officers of the U. S. Coast Guard designated by the Commandant to have jurisdiction, under the appropriate District Commanders, over specified areas. They are charged with the enforcement of certain laws, rules, and regulations affecting the movements of vessels and cargoes. The offices and districts on the Pacific coast are listed in the Appendix.

Harbor masters are appointed for the principal ports, and they are listed in the Appendix.

Supplies.—Vessels usually obtain their supplies in either San Diego, Los Angeles, San Francisco, Columbia River, or Puget Sound. Coal can be obtained at a number of points. Fuel oil can be obtained at all the principal ports. Ship-chandler's stores can be had at San Diego, San Pedro, San Francisco, Humboldt Bay, Coos Bay, Columbia River, and Puget Sound, and in limited quantities at several other places.

Repairs.—Extensive repairs to large vessels can be made only in Los Angeles Harbor, San Francisco Bay, Portland, and Seattle. Small motor boats and yachts can be hauled out, and ordinary repairs to machinery can be made at several other places.

Miscellaneous.—For information of any particular kind about a definite locality refer to the locality in the text.

For general information of a local character, including the addresses of the offices maintained by different bureaus of the Government, meteorological tables, conversion tables, etc., refer to the Appendix.

Chapter 3.—ROUTES AND SAILING DIRECTIONS

DIRECTIONS, SAN DIEGO TO THE STRAIT OF JUAN DE FUCA

Vessels may use the following directions, which give approximately the track followed by high-powered steamers plying regularly between San Diego, Los Angeles, San Francisco, Columbia River, and Puget Sound ports. These courses are used by such vessels in preference to others farther offshore by reason of the fact that they lead well within range of the various fog-signals and insofar as possible over depths where the lead may be used to obtain a check on the position.

Caution.—Strict adherence to the recommended courses (track lines shown in red on sailing charts) might conceivably result in collision in the case of meeting vessels. This contingency might occur in thick weather on courses where the distances run are short. It is recommended, for southbound vessels, that the courses be shaped about ¼ to ½ mile outside the track lines to pass to the right of northbound traffic.

Low-powered local steamers usually keep close inshore, following in general, the curves of the land, in order to escape the full effect of wind and sea. In clear weather strangers may readily follow this inshore track by means of the chart; in thick weather they are advised not to use it, as the fog-signals are few and far apart, and the currents variable and uncertain, making detailed local knowledge essential to safety. For that reason no directions for this track are given.

A detailed description of the coast, including landmarks, dangers, etc., follows these directions, beginning on page 51.

Directions

Table 1.—SAN DIEGO TO SAN FRANCISCO

CHARTS 5101, 5202, 5302, 5402

Positions (*Reverse directions in italics*—read upward)	True courses	Distances
	Degrees	*Nautical miles*
1. Point Loma Light, bearing 45°, distant 2.4 miles. Chart 5101.		
Direct	320	81. 6
Reverse	*140*	*81. 6*
2. Point Fermin Light, bearing 35°, distant 1.9 miles.		
Direct	293	56. 0
Reverse	*113*	*56. 0*
3. Anacapa Island Light, bearing 202°, distant 1.8 miles. Change to Chart 5202.		
Direct	291½	61. 2
Reverse	*111½*	*61. 2*
4. Point Conception Light, bearing 25°, distant 2 miles.		
Direct	307	12. 8
Reverse	*127*	*12. 8*
5. Point Arguello Light, bearing 50°, distant 2.8 miles. Change to Chart 5302. If bound to San Luis Obispo see Directions, page 96.		
Direct	329½	122 1
Reverse	*149½*	*121. 1*
6. Point Sur Light, bearing 60°, distant 2.5 miles. Change to Chart 5402. If bound to Monterey, see Directions, page 108.		
Direct	336	58. 1
Reverse	*156*	*58. 1*
7. Pigeon Point Light, bearing 70°, distant 2 miles.		
Direct	339	36. 6
Reverse	*159*	*36. 6*
8. San Francisco Lightship, bearing 55°, distant 1 mile. If entering San Francisco Bay, see Directions, page 122. If bound northward, see Directions, page 45.		

Table 2.—SAN DIEGO TO SAN PEDRO BAY

CHART 5101

Positions (*Reverse directions in italics*—read upward)	True courses	Distances
	Degrees	*Nautical miles*
1. **Point Loma Light,** bearing 45°, distant 2.4 miles.		
Direct	323	81. 0
Reverse	*143*	*81. 0*
2. **Los Angeles Harbor Light,** bearing 270°, distant 300 yards.		

Table 3.—SAN PEDRO BAY TO SAN FRANCISCO

CHARTS 5143, 5101, 5202, 5302, 5402

1. **Los Angeles Harbor Light,** bearing 315° distant 0.25 mile. Chart 5101.		
Direct	245	3. 7
Reverse	*065*	*3. 7*
2. **Point Fermin Light,** bearing 35°, distant 1.9 miles.		
Continue as per table No. 1, from position No. 2 Point Fermin Light, to San Francisco Lightship.		

The following brief summary of the methods actually employed in thick weather, by the ablest masters on the coast, indicates the methods and precautions by which safety is assured.

Northbound.—From San Diego to Los Angeles (see table No. 2, above) the conditions are seldom such as to cause any deviation from the track. If uncertain of the position in approaching San Pedro Bay, steer so as to make sure of being to the eastward of Los Angeles Harbor Light on outer end of the westerly breakwater. Continue to a depth of 10 fathoms and then haul to the westward in that depth, and the fog signal (diaphone) will be made without difficulty.

Crossing toward Anacapa Island Light (table 1, position 3) from Point Fermin, when bound for San Francisco the possibility of a northerly current setting into Santa Monica Bay should be borne in mind. There is a diaphone fog signal at Anacapa Light. Having made Anacapa Light, there are no dangers until approaching Point Conception. Here sounding should be relied upon to guard against an inshore set, and the depths should not be shoaled to less than 50 fathoms. From Point Conception, Point Arguello will readily be made.

The track from Point Arguello to Point Sur is a long one, on which currents of considerable velocity are frequently encountered, and to the southward of Point Sur depths of over 100 fathoms extend so close to the beach that a vessel cannot count on getting bottom with the lead in time to prevent disaster. Point Sur, therefore, should be given a wide berth. If, on this track, the weather has not cleared by the time Piedras Blancas has been reached, the vessel should be hauled out 2° or 3°, and great caution should be exercised as Point Sur is approached.

The lead should find bottom off Point Sur, but even if it does not, no difficulty should be experienced in making a landfall northward of Monterey Bay, as the depths shoal very gradually from the 100-fathom curve to the beach. The track to the lightship may then be followed by means of sounding.

Vessels equipped with echo sounding apparatus should use this valuable aid to navigation constantly in conjunction with modern charts for fixing the vessel's position.

Detailed local knowledge is necessary for entering the Golden Gate in thick weather, because of the strong, irregular currents and tide rips. At times, however, it will be clear within the heads when it is foggy outside. It is well, therefore, to stand in cautiously as far as lighted bell buoy no. 7; if from that vicinity Point Bonita cannot be seen, the vessel should be anchored until the weather clears.

Southbound.—The courses from the bar to Point Sur are short and should be easy to make good, especialy as the 100-fathom curve extends well offshore to the northward of Point Sur, affording ample opportunity for checking the vessel's position by sounding as the point is approached.

Likewise, on the long course from Point Sur to Point Arguello, the latter point may be reached without difficulty. If the lead shows 30 fathoms, haul to a south-southeast (mag.) course, keeping in that depth, and if the water deepens to over 40 fathoms the vessel will be past the point, and may be hauled up for Point Conception.

Again, in approaching Anacapa Island, soundings may be used to guide the vessel to within sound of the fog signal. A fix should be obtained off Anacapa Island before attempting to approach Point Vicente.

Point Vicente, formerly considered the most difficult point to make on the southward track, is now marked by a light and fog signal. Deep water extends so close to the point that the navigator will get an echo from his whistle before he gets bottom with the lead. From Anacapa Island, the course should be shaped to pass about 2 miles off Vicente, and the lead should be used as the point is approached.

Guided by the soundings, Los Angeles Harbor Light can be made after passing Point Fermin.

Strangers should not attempt to enter Los Angeles inner harbor in thick weather without a pilot.

Vessels bound from Los Angeles to San Diego usually experience little difficulty in making Point Loma. If in doubt, the course may be shaped to pick up the 30-fathom curve to the northward of the point, and that depth followed to the fog signal. The presence or absence of kelp just inside the 30-fathom curve is a good guide in deciding whether the vessel is north or south of the point.

Stangers should not attempt to enter San Diego Bay in thick weather without a pilot.

Table 4.—SAN FRANCISCO TO STRAIT OF JUAN DE FUCA

CHARTS 5052, 5502, 5602, 5702, 5802, 5902 6002, 6102

Positions (*Reverse directions in italics*—read upward)	True courses	Distances
	Degrees	*Nautical miles*
1. San Francisco Lightship, bearing 55°, distant 1 mile. Chart 5502.		
Direct	311½	21. 4
Reverse	*131½*	*21. 4*
2. Point Reyes Light, bearing 45°, distant 1.6 miles.		
Direct	327	67. 7
Reverse	*147*	*67. 7*
3. Point Arena Light, bearing 65°, distant 4.5 miles. Chart 5602.		
Direct	340	96. 2
Reverse	*160*	*96. 2*
4. Blunts Reef Lightship, bearing 80°, distant 1.5 miles. Charts 5602 and 5702.		
Direct	356½	144. 7
Reverse	*176½*	*144. 7*
5. Cape Blanco Light, bearing 90°, distant 7.5 miles. Charts 5802, 5902, 6002 and 6102.		
Direct	359	320
Reverse	*179*	*320*
6. Umatilla Reef Lightship, bearing 95°, distant 1 mile. Chart 6102.		
Direct	013	16. 1
Reverse	*193*	*16. 1*
7. Cape Flattery Light, bearing 145°, distant 2.7 miles.		

Table 5.—SAN FRANCISCO TO COLUMBIA RIVER

CHARTS 5052, 5502, 5602, 5702, 5802, 5902

Proceed as per table 4, San Francisco Lightship to Cape Blanco Light.		
5. Cape Blanco Light, bearing 90°, distant 7.5 miles. Charts 5802 and 5902.		
Direct	006½	202
Reverse	*186½*	*202*
6. Columbia River Lightship, bearing 90°, distant 0.5 mile.		

Table 6.—COLUMBIA RIVER TO THE STRAIT OF JUAN DE FUCA

CHARTS 6002, 6102

1. Columbia River Lightship, bearing 90°, distant 0.5 mile. Charts 6002 and 6102.		
Direct	347	122
Reverse	*167*	*122*
2, Umatilla Reef Lightship, bearing 95°, distant 1 mile.		
Continue as per table 4, Umatilla Reef Lightship to Cape Flattery Light.		

The following brief summary of the methods actually employed in thick weather by the ablest masters on the coast indicates the methods and precautions by which safety is assured:

Northbound.—Taking the departure from Point Bonita, there should be no trouble in making the lightship and very little in making Point Reyes, if the track is checked by sounding.

Approaching Point Arena, start sounding when off Gualala and continue until assured that the ship is not inside the track. Point Arena fog signal will nearly always be heard north and south of the point, but seldom when abeam if over 2 miles distant.

When within 10 miles of Punta Gorda soundings should be taken as rapidly as possible, as the depths shoal abruptly; also, with soundings taken infrequently, there

is a possibility with wire sounding that the lead will drop in the successive submarine valleys, entirely missing the shoal areas in between and resulting in the dangerous and erroneous conclusion that the vessel is wide of the point. If Punta Gorda is passed in not less than 50 fathoms the vessel will also clear Blunts Reef. If, however, the course is changed at Cape Mendocino without making the lightship, sounding should be continued long enough after the change to make certain that the vessel is not behind her reckoning.

Vessels equipped with echo sounding apparatus have a valuable aid in checking the vessel's track. However, caution must be exercised not to confuse the various canyons with consequent erroneous conclusions of the vessel's position.

After safely passing Blunts Reef Lightship, soundings need not be taken again until approaching the shoal off Rogue River. Here the bottom should be searched for in the same manner as in approaching Punta Gorda, as the soundings obtained on this shoal give a check on the latitude and indicate any change of course necessary in approaching Orford Reef, 20 miles beyond. If less than 60 fathoms is obtained the ship should be hauled out at least a point and, in any case, the lead should again be used in approaching Orford Reef. The lead may find no bottom off the reef, but to the northward of Cape Blanco bottom, fine, gray sand will be found in 70 to 80 fathoms if the vessel is near the track.

If bound for the Columbia River the vessel, after passing Cape Blanco, will be within soundings obtainable with the lead for practically the entire distance. If uncertain of the position, edge in to a depth of 32 to 35 fathoms anywhere between Cape Meares and Tillamook Rock and steer northwest in that depth and the fog signal on Tillamook Rock will usually be heard. At times difficulty may be experienced in hearing this fog signal, even when passing it in that depth. However, if the vessel keeps outside the 30-fathom curve she cannot get into trouble, and the change in direction of that curve is a good indication of the time at which the vessel passes Tillamook Rock. The lightship can then be made by following the 30-fathom curve.

Vessels bound for the Strait of Juan de Fuca frequently steer one course from Blunts Reef Lightship, Cape Mendocino, applying to the true course the mean of the magnetic variations. This causes the track to curve away from the shores during the first half of the distance, approaching them during the remainder. Approaching the strait, if the position is uncertain, stand in to pick up the 30-fathom curve in the vicinity of Cape Elizabeth or Destruction Island and follow that depth to make Umatilla Reef Lightship. Thence the short distance to Tatoosh Island may be traversed without difficulty.

Caution, Currents.—Mariners are warned that a combination of tidal, non-tidal, and wind currents may result in a current of considerable velocity along the coast of Washington. A maximum current of 3.3 knots has been reported.

Southbound.—Taking the departure from Umatilla Reef Lightship steer one course for Cape Mendocino as described above. Use the lead to pick up Heceta Bank, as vessels may overrun their distance, particularly during the summer. The time required in crossing the bank gives a good determination of the vessel's position at the time the lead drops again into deep water.

Cape Blanco should be passed with caution. If soundings taken show less than 60 fathoms, haul out parallel to the coast until the depths are increased materially; the vessel will then be past Cape Blanco. Recent surveys show the area off Cape Blanco to be of even bottom with the 60-fathom curve 5½ miles off the cape.

Vessels from the Columbia River should use the lead frequently to guard against an inshore set. Vessels at times have encountered a strong set on or offshore in the region between Heceta Bank and Cape Arago, when none was apparent farther northward. Cape Blanco should be rounded as described in the preceding paragraph.

After passing Orford Reef there are no dangers until in the vicinity of Cape Mendocino. Currents setting the vessels directly on or offshore have been reported between Trinidad Head and Cape Mendocino and for that reason, as the former point is approached, an occasional deep sounding should be taken, and from the time the vessel is abreast of Table Bluff the lead or other means of sounding should be used frequently.

This course should lead across the head of a submarine valley about 15 miles northwest of Cape Mendocino. Here the navigator may lose the bottom (unless equipped with echo sounding apparatus) as the depths drop off suddenly to 400 fathoms, but in about 5 miles bottom should again be picked up in about 60 fathoms. Cape Mendocino is a dangerous point and many vessels have been lost here. The mariner can not be too careful in rounding this point. The charts now show complete hydrographic surveys of this area, and should be studied carefully with the soundings obtained. After changing course the sounding should be continued to pick up the submarine valleys south of the cape. The echo sounding apparatus, used in conjunction with the modern chart, is an invaluable aid.

Approaching Point Arena, start sounding 10 or 15 miles north of the point, and if at any time the lead shows 40 fathoms or less, haul out on a south (magnetic) course in not less than 40 fathoms. In this way the fog signal will usually be made; if not, and the water deepens to 60 fathoms, the vessel will be past the point and the course may be changed for Point Reyes. Arena Rock, with 2¼ fathoms over it, is only ¾ mile inside the 30-fathom curve.

Point Reyes fog signal should be made before proceeding beyond it and if the vessel's position has been located off Point Arena little difficulty should be experienced in doing so. But if the vessel has passed wide of Arena without obtaining a fix, caution is necessary, as the soundings may be misleading. Practically the same chain of soundings can be obtained in the vicinity of Cordell Bank as on the regular track passing Point Reyes, and vessels, although sounding frequently, have been known to find themselves in the midst of the Farallones while still anxiously trying to pick up Point Reyes. An occasional sounding should, therefore, be taken after passing Point Arena to verify the distance off land.

In the immediate vicinity of Point Reyes the character of the bottom is a better indication of the position than are the depths. North of the point the lead will bring up a muddy substance; south of it, gray sand. This indication is particularly valuable in the area to the northward and eastward of the point.

Having made Point Reyes fog signal, there should be little difficulty experienced in making the light vessel, provided the lead is used to check the course.

Detailed local knowledge is necessary for entering the Golden Gate in thick weather, because of the strong, irregular currents and violent tide rips. At times, however, it will be clear within the heads when it is foggy outside. It is well, therefore, to stand in cautiously as far as lighted bell buoy No. 7; if from that vicinity Point Bonita cannot be seen, the vessel should be anchored until the weather clears.

Table 7. STRAIT OF JUAN DE FUCA TO SEATTLE AND TACOMA

CHARTS 6102, 6382, 6450, 6460

Position (*Reverse directions in italics*—read upward)	True courses	Distances
	Degrees	*Nautical miles*
1. Cape Flattery Light, bearing 145°, distant 2.7 miles, Chart 6102.		
Direct	101½	50. 6
Reverse	*281½*	*50. 6*
1A. Swiftsure Bank Lightship, bearing 30°, distant 1.3 miles.		
Direct	105	60. 8
Reverse	*285*	*60. 8*
2. Race Rocks Light, bearing 0°, distant 2.2 miles, Charts 6102, 6382. Pass New Dungeness Light 180°, 1.8 miles distant. Head for Old Tower on Admiralty Head.		
Direct	100	31. 7
Reverse	*280*	*31. 7*
3. Point Wilson Light, bearing 190°, distant 1.5 miles, Chart 6450.		
Direct	143	4. 7
Reverse	*323*	*4. 7*
4. Marrowstone Point Light, bearing 233°, distant 0.5 mile. Pass Bush Point Light abeam, distant 0. 5 mile. Vessels going north to British Columbia and Alaska via Inside Passage, see Tables 8 and 9 on pages 49 and 50.		
Direct	154	9. 8
Reverse	*334*	*9. 8*
5. Double Bluff lighted horn buoy, bearing 64°, distant 0.8 mile.		
Direct	136	3. 3
Reverse	*316*	*3. 3*
6. Point No Point Light, bearing 226°, distant 0.75 mile.		
Direct	158	6. 4
Reverse	*338*	*6. 4*
7. Apple Cove Point Light, bearing 248°, distant 1.2 miles.		
Direct	178	10. 2
Reverse	*358*	*10. 2*
8. West Point Light, bearing 41°, distant 0.7 mile with Duwamish Head Light ahead (*astern.*)		
Direct	143	2. 0
Reverse	*323*	*2. 0*
9. Fourmile Rock Light, bearing 193°, distant 0.75 mile, Chart 6449.		
Direct	114	3. 4
Reverse	*294*	*3. 4*
10. Seattle, Colman Dock		
BOUND TO TACOMA AND BEYOND		
8. West Point Light, bearing 41°, distant 0.7 mile.		
Direct	178	4. 7
Reverse	*358*	*4. 7*
9A. Alki Point Light, bearing 88°, distant 0.9 mile. Pass Point Pully Light 0.3 mile distant. Chart 6460.		
Direct	164	12. 0
Reverse	*344*	*12. 0*
10A. Point Robinson Light, bearing 295°, distant 0.6 mile.		
Direct	219	6. 5
Reverse	*039*	*6. 5*
11A. Brown Point Light, bearing 95°, distant 0.8 mile. If bound to Olympia and beyond see page 362.		
Direct	139	2. 0
Reverse	*319*	*2. 0*
12A. Tacoma, off the wharves.		

Navigation in the Strait of Juan de Fuca is simple in clear weather; the aids to navigation are numerous, and the chart is a good guide. In thick weather, owing to the irregularity of the current, strangers should use a pilot.

The channels in Puget Sound are broad, open, and free from outlying dangers. In thick weather the use of whistle echos is common by those with local knowledge; in certain localities, soundings will enable the mariner to check his position.

*The courses given are the usual ones followed by vessels, but a midchannel track should be followed when it is desired to make the most of a favorable current.

Strangers when overtaken by fog in these waters are advised to anchor, if practicable, or to employ a pilot who may be obtained in Port Angeles or Port Townsend, or from Seattle on about 12 hours' notice. Available anchorages are pointed out under the descriptions of the various localities. Sailing vessels, except small coasting schooners, are generally towed in these waters.

Table 8. SEATTLE TO GEORGIA STRAIT VIA ROSARIO STRAIT

CHARTS 6450, 6380

Position (*Reverse directions in italics*—read upward)	True courses	Distances
Proceed as per table 7. Seattle, Colman Dock to Point Wilson.		
1. Point Wilson Light, bearing 190°, distant 1.5 miles, Chart 6450.	*Degrees*	*Nautical miles*
Direct	326	3. 8
Reverse	*146*	*3. 8*
2. Point Partridge Light, bearing 83°, distant 1.1 miles. Pass Minot Island Light abeam 1.0 mile distant. Change to Chart 6380.		
Direct	002	11. 5
Reverse	*182*	*11. 5*
3. Davidson Rock Light, bearing 272°, distant 0.9 mile.		
Direct	028	5. 1
Reverse	*208*	*5. 1*
4. Burrows Island Light, bearing 136°, distant 0.9 mile. Pass Belle Rock Light abeam, 0.9 mile distant and Black Rock Beacon abeam 0.8 mile distant. If bound for Bellingham Bay see page 302.		
Direct	350	7. 0
Reverse	*170*	*7. 0*
5. Obstruction Passes Light, bearing 260°, distant 1.8 miles. Pass Peapod Rocks Light abeam 0.4 mile distant.		
Direct	024	3. 5
Reverse	*204*	*3. 5*
6. Lawrence Point, bearing 289°, distant 0.8 mile. (Peapod Rocks Light bears 225°, 1.2 miles and Viti Rocks Light bears 109°, 4.2 miles.)		
Direct	342	3. 5
Reverse	*162*	*3. 5*
7. Clark Island, North end, bearing 252°, distant 0.65 mile. Pass Puffin Island Light abeam 0.4 mile distant.		
Direct	315	7. 3
Reverse	*135*	*7. 3*
8. Patos Island Light, bearing 262½°, distant 3.6 miles. (In range with Saturna Island Light.)		
Shape course up Georgia Strait as desired.		

*Note: Because of the war emergency (1942) setting up defensive sea areas, some of the recommended courses are not applicable for the duration.

These directions are available for vessels of any draft in clear weather. In thick weather, strangers are advised to take a pilot. A range should be steered when possible, so as to insure making the compass courses good.

Between Admiralty Inlet and the entrance to Rosario Strait, the current on the flood has a tendency to set a vessel eastward toward Whidbey Island; it also sets strongly through Deception Pass and up Rosario Strait. At night avoid the red sector of Burroughs Island Light to clear Lawson Reef and Dennis Shoal. Through Rosario Strait the currents run with considerable velocity. Heavy tide rips and swirls are found off Black Rock, Obstruction Passes, Peapod Rocks, and Lawrence Point.

Table 9. SEATTLE TO GEORGIA STRAIT VIA HARO STRAIT AND BOUNDARY PASS

CHARTS 6450, 6380

Position (*Reverse directions in italics*—read upward)	True courses	Distances
Proceed as per table 7. Seattle, Colman Dock to Marrowstone Point Light.		
1. **Marrowstone Point Light** bearing 233°, distant 0.5 mile. Chart 6450. Pass Point Wilson Light abeam 0.7 mile distant and Partridge Bank lighted bell buoy abeam distant 1.1 miles.	*Degrees*	*Nautical miles*
Direct	317	13.8
Reverse	*137*	*13.8*
2. **Smith Island Light** bearing 47°, distant 3.7 miles. Change to chart 6380. Pass Hein Bank lighted bell buoy abeam 1.5 miles distant.		
Direct	322½	17.2
Reverse	*142½*	*17.2*
3. **Lime Kiln Light** bearing 52°, distant 1.2 miles. Pass Kellett Bluff Light abeam 0.45 mile distant.		
Direct	344	11.8
Reverse	*164*	*11.8*
4. **Turn Point Light** bearing 102°, distant 0.8 mile, with Patos Island Light ahead (*astern*).		
Bound through Swanson Channel see courses in *Alaska Coast Pilot, Part I.*		
Direct	063	10.0
Reverse	*243*	*10.0*
5. **Saturna Island Light** bearing 328°, distant 1.0 mile.		
Direct	039	2.5
Reverse	*219*	*2.5*
6. **Patos Island Light** bearing 129°, distant 1.1 miles.		
Shape course up Georgia Strait as desired.		

In crossing from Admiralty Inlet to the entrance of Haro Strait the tidal currents setting to and from Rosario Strait and San Juan Channel, with estimated velocities of 2 to 3 knots, should be kept in mind. Between Henry Island and Turn Point, and around Turn Point, there are heavy tide rips on the ebb; and particularly heavy and dangerous tide rips occur on the ebb between East Point and Patos Island and for 2 miles northward in Georgia Strait. The flood from Rosario Strait, which is felt as soon as the passage between Orcas and Sucia Islands is open, is apt to set a vessel toward East Point. The ebb in this vicinity sets to the eastward even before Georgia Strait is well open.

Chapter 4.—SAN DIEGO TO SANTA MONICA BAY

(CHART 5101)

In this chapter, following the description of the coast from San Diego to Santa Monica Bay, are given the detailed descriptions of the islands lying off that section of the coast, including San Clemente, Santa Catalina, San Nicolas, and Santa Barbara. The descriptions of Anacapa, Santa Cruz, Santa Rosa, and San Miguel Islands follow in the next chapter.

Vessels approaching this locality from the southward in clear weather will make Table Mountain and the high land in its vicinity, and the Coronado Islands before sighting the landmarks at San Diego.

Table Mountain, shown on Coast and Geodetic Survey Chart 5020, and Hydrographic Office Charts 1149 and 5196, is 2,244 feet high. It is a flat-topped and prominent mountain, lying in Mexican territory, about 24 miles southeastward of Point Loma, and about 6 miles inland.

Los Coronados, shown on Coast and Geodetic Survey Charts 5101 and 5020, and Hydrographic Office Charts 1149 and 5196, lie in Mexican territory, and are a group of four bare, rocky islands extending 4.5 miles in a west-northwesterly direction, about 7 miles offshore. The northwestern island, 467 feet high, lies nearly 14 miles 192° from Point Loma; the southeasternmost and largest is 672 feet high. These islands are prominent in clear weather. The passage eastward of these islands is commonly used by steamers.

The two central islets, lying, respectively 0.5 and 0.8 mile westward of the north end of South Coronado, are small barren rocks, 251 and 101 feet high, respectively. The depths in the vicinity of the Coronado Islands are irregular, and in thick weather or at night caution must be observed when near them.

South Coronado Island Light, located on the southern end of the island, is shown from a white cylindrical tower. It is 190 feet above the sea, and is visible 20 miles. It is obscured from certain directions by both Middle Coronado and North Coronado.

Puerto Cueva Light is shown at the northeastern end of South Coronado Island. It is 157 feet above the sea, on a white square masonry tower. It is visible from 169° to 341° and has been reported to be visible between 44° and 70°. It is sometimes obscured by local fog.

Boundary Monument† is the western initial point of the boundary line between the United States and Mexico and is marked by a white marble obelisk about 20 feet high, resting on a pedestal at an elevation of 41 feet above water. The monument stands about 200 yards from the beach, near the edge of a low table bluff, about 10 miles 142° from Point Loma Light and is plainly visible from seaward. Directly northward of this monument the mesa falls to the low, marshy land southward of San Diego Bay, and to the eastward the land rises. A stone mound, 365 feet above water marking a second point of the boundary line, is located about 1 mile eastward of the monument.

†Lat. 32°32′.0, Long. 117°07′.5: Charts 5101, 5101A.

Aircraft bombing targets are established from time to time southward from San Diego Bay entrance. Notices of establishment and removal are given in the Weekly Notices to Mariners. Vessels should keep clear of the vicinity of these targets.

From seaward.—In clear weather vessels approaching from seaward will raise San Clemente Island, the southernmost of the Santa Barbara Islands, before the distinguishing features of the coast can be seen. This will check the vessel's position and indicate the subsequent shaping of the course for Point Loma. Upon a nearer approach, Cuyamaca Peak and the high land of the interior, the Coronado Islands, and Point Loma, will be distinguished. Several aero beacons in the vicinity of San Diego are visible from seaward.

The farthest **offshore dangers** are Bishop Rock, and the shoals off San Nicolas Island.

Sixtymile Bank (Chart 5020), located about 60 miles southwestward of San Diego harbor entrance, has a least depth of 53 fathoms. Differences of 3° or more from the normal magnetic variation have been observed within a radius of 8 miles of this bank.

Bishop Rock (Chart 5101), on which the clipper ship *Bishop* struck in 1855, has but 2½ fathoms over it and is the shoalest point on **Cortes Bank.** It is located in latitude 32° 27′ north and longitude 119° 08′ west, about 40 miles southwestward of San Clemente Island. This rock is the farthest outlying danger on the coast. The currents in this vicinity are largely non-tidal in character; velocities between 1 and 2 knots have been measured. These currents cause considerable swell and even in moderate weather the rock usually shows a breaker. Navigators should use great care when in this vicinity. The rock is marked by a whistle buoy and a special station buoy. In January 1920 the buoy broke adrift and when picked up it was found to have drifted in a direction 142° true at a rate of a little over 0.5 mile per hour.

For about 2.5 miles southeastward of Bishop Rock the bottom is very broken and the locality should be avoided. About 5 miles northwestward of Bishop Rock is a 9-fathom spot, on which the bottom is extremely broken. Although no breakers have been reported here, deep-draft vessels should avoid this spot.

Tanner Bank covers an area about 15 miles long in a west-northwesterly direction, and is about 5 miles wide. The least depth as far as known is 12 fathoms. The northwestern end of the bank lies about 28 miles southeastward from the eastern end of San Nicolas Island.

SAN DIEGO BAY AND APPROACHES

(CHART 5105*)

The entrance to San Diego Bay lies about 10 miles northwestward from the boundary between the United States and Mexico. The bay is the best natural harbor south of San Francisco and affords perfect protection in any weather. The bay is separated from the ocean by a low, narrow, sand spit, which at its northern end expands to a width of 1 mile and is nearly divided by **Spanish Bight,** partly dry at low water.

Point Loma, the western point at the entrance, is the southern point of a ridge about 400 feet high. It is bare of trees, except in the gullies, and where planted around the houses built near the summit; otherwise it is sparsely covered with grass, sagebrush, and cactus. At a distance it is usually raised as an island. **Point Loma Light** is shown from a white skeleton tower on the southern extremity of the point; the light is 88 feet above the water, and visible 15 miles; the fog signal is a two-tone air diaphone (siren if

*Chart 5105, scale 1:10,000, shows the entrance to the bay and the northern part, including the principal wharves at San Diego. Chart 5107, scale 1:20,000, extends farther offshore, includes the whole bay, and is on a large enough scale for ordinary navigation.

disabled). A radio beacon equipped for distance-finding is operated at Point Loma Light.

On a nearer approach the old tower on the highest part of the hill immediately back of the point will be made out. Other prominent objects along the crest of the ridge are the radio masts with a large black water tank close by, 2.6 miles northward from the light, and the glass dome surmounting the main building of the former Theosophical Institute, 3.3 miles northward from the light.

Heavy kelp extends for over 1.5 miles southward of Point Loma.

North Island is low and flat and is an extensive aviation field. The tower of the Naval Administration Building at the north point of North Island shows well from the entrance. The high chimney at the Marine Barracks, on the north side of the bay, is prominent from the western portion of the bay. An aeronautical light, used for the control of air craft, is located on top of the Administration Building. It is 92 feet above the water and is operated intermittently with varying characteristics. These features and others that are readily identified, are shown on Charts 5105 and 5107 and afford the navigator means for determining his position frequently.

Ballast Point, low and sandy, projects 0.4 mile northeastward from the eastern side of Point Loma, 1 mile northward from the lighthouse. **Ballast Point Light,** shown from a white square tower attached to dwelling, and buildings, are situated on the extremity of the point. The light is 34 feet above water; the fog signal is an air diaphone (bell if disabled). There is deep water close to the outer end of the point.

A jetty has been built southward from **Zuñiga Point,** on **Zuñiga Shoal,** for a distance of about 7,500 feet. The outer half of this jetty is at present (1941) submerged.

Channels.—The entrance channel, across the bar to Ballast Point, has a project width of 800 feet and a depth of 40 feet at mean lower low water. The controlling depth in May 1942 was 40 feet. It is marked by buoys, some of which are lighted, and by a lighted range.

The bay channel, project depth 35 feet, width 2,200 feet, extends from near Ballast Point to the turning basin (same project depth) off the municipal piers. The controlling depth in 1941 was 35 feet. It is well marked by beacons and buoys.

Above San Diego, the **South Bay** channel (chart 5107) has a project width of 1,500 to 2,500 feet, a depth of 30 feet and a length of approximately 20,000 feet. In March 1942, the controlling depth was 30 feet.

The channel to National City and **Chula Vista** has a project width of 200 feet and a depth of 20 feet. In June 1941, the controlling depth was 16 feet.

A channel, 0.5 mile long, has been dredged northward from the end of the city bulkhead at the foot of Date Street to the fish canneries near the municipal airport. It had a controlling depth of 20 feet in 1941.

The channel extending into Spanish Bight as far as the bridge was being deepened in 1941 to a proposed depth of 12 feet.

There is a dredged channel, marked by beacons, for entering **Glorietta Bay, Coronado Island.** This channel had a controlling depth of 10½ feet in 1935. Three sets of lighted ranges mark the axis of the channel. This channel is used by small pleasure craft proceeding to the yacht club.

†In_____19____, the controlling depths in the channels were:_____

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_____

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

Pilots are usually employed by strangers. The pilot station is at Ballast Point, and pilots may be obtained by signaling the light station at Point Loma. If possible, vessels desiring a pilot should radio ahead, stating the expected time of arrival off the entrance. The following are extracts from the laws concerning pilotage:

All vessels sailing under enrollment and licensed and engaged in the coasting trade, between the port of San Diego and any other port of the United States, shall be exempt from all pilotage, unless a pilot is actually employed.

All foreign vessels and vessels from a foreign port or bound thereto, and all vessels sailing under a register between the port of San Diego and any other port of the United States, shall be liable for pilotage.

Towboats.—Gas and Diesel towboats ranging from 50 to 250 horsepower are available. Rates vary from $5 to $15 per hour. Naval tugs and Coast Guard cutters are based at San Diego and are available in emergencies.

Quarantine is enforced in accordance with the regulations of the United States Public Health Service. The quarantine station is at **La Playa,** and vessels subject to visitation do not go beyond until they have been granted pratique. The boarding boat meets the vessel between the bar and La Playa.

Customs.—San Diego is the headquarters of the San Diego customs collection district. The customs offices are located in the Federal Building on F Street, between State and Union Streets. The customs barge office, maintaining a 24-hour guard service, is located on the municipal Broadway Pier. Marine documents are issued.

Immigration.—Immigration officials are stationed at San Diego for the inspection of passengers and crews of incoming vessels in the foreign trade. Such vessels are boarded by inspectors at the quarantine pier or in the stream.

Marine Hospital.—The Public Health Service maintains a medical relief station at 722 Electric Building in charge of a service officer.

Anchorage can be had anywhere in the channel and off San Diego, except in a lane 1,000 feet wide, the center line of which extends southward from the south end of Atlantic Street (street along west water front of San Diego and leading to the Santa Fe Railroad wharf) to the ferry wharf at Coronado opposite. Anchorage can be had in the channel eastward of this lane in depths of 18 to 42 feet. A fairway must be left clear for passing vessels. Vessels outside the entrance, waiting for a pilot, will find good anchorage in 36 to 54 feet anywhere eastward of the line joining the bell and whistling buoys.

The anchorage grounds above the municipal piers are usually occupied by naval craft when the fleet is in home waters. Fore and aft mooring is not required and during slack water the main channel is often partially obstructed by vessels trailing in different directions.

There is a yacht anchorage with depths of from 9 to 14 feet off the yacht club wharf at **Fisherman Point** (Roseville).

Harbor regulations are enforced by the port director, with offices in the Harbor Administration Building near Broadway Pier.

A complete set of harbor regulations may be had upon application to the port director.

Aircraft warnings.—There is danger of collision between patrol planes and small boats operating in and out of San Diego. To avoid this, the following measures have been promulgated by the Commandant, Eleventh Naval District, San Diego, California:

When patrol planes are operating involving take-off and landings, there will be displayed on a hangar on the northeast end of North Island the International Danger Flag "U" by day and two vertical red lights by night.

Shipping should keep a sharp lookout for patrol planes at all times whether on the water, taking-off or landing, and give them a wide berth.

When massed flights involving a large number of patrol planes are in progress the take-off or landing area will be patrolled by boats. By day these boats will display a red flag and by night a red lantern. The waving of a red flag or red light at an approaching boat is to be construed as a danger signal. Boats so warned should look for and sight the plane or planes, and alter course as necessary, preferably hauling immediately to the side of the channel and waiting for a clear time to proceed.

Tides.—The mean range of tide at San Diego is 4.2 feet. The range between mean lower low water and mean higher high water is 5.8 feet. A range of about 9 feet may occur at the time of maximum tides. Daily tide predictions for San Diego are given in the tide tables published annually in advance by the United States Coast and Geodetic Survey.

Currents.—The currents set generally in the direction of the channels. In the vicinity of the entrance, the usual velocity at strength varies from ½ to 3 knots depending upon the stage of the tide. Westward of Middle Ground north of Ballast Point is an inshore eddy of 0.1 to 0.3 knot on both flood and ebb. On the flood the current sets northwestward over Middle Ground, and on the ebb, in the opposite direction. Southward of the end of the jetty there is a slight set toward Zuñiga Shoal on the ebb. The average central surface velocity in the channel east of Ballast Point at the time of strength is about 1½ knots. Great care should be taken while passing this point as a vessel may take a sudden shear caused by a cross current deflected from Ballast Point.

An eddy is usually encountered along the ends of the municipal piers, which makes docking difficult. The velocity and direction of the eddy are irregular and the greatest care must be exercised by even the most experienced. Strangers should not attempt to dock large vessels without a pilot.

For daily predictions of the times of slack water and times and velocities of strength of current see the *Pacific Coast Current Tables* published in advance annually by the Coast and Geodetic Survey.

Directions.—Having made the lighted whistle buoy or Point Loma Lighthouse, proceed as convenient to a position 100 yards eastward of the outside bar lighted bell buoy, keeping clear of the kelp which extends southward from Point Loma. Then follow midchannel courses using the chart (5105) as a guide.

SAN DIEGO

Wharves.—The depths at the wharves vary from 18 to 33 feet according to the locality. The municipality maintains two modern piers having a depth alongside of 33 feet at MLLW. They handle practically all of the general cargo of the port.

Toll rates (the charge made on merchandise passing over the city premises) and **wharfage charges** (charge made on merchandise left on city premises) vary with the class of freight. Rates can be had from the port director upon application.

Storage.—There is a one-story warehouse on the waterfront having a capacity of 600,000 cubic feet of storage space. In addition there are two warehouses used for general storage which are bonded under United States customs.

Supplies.—Fuel oil may be had in any quantity from the oil docks with depths of 26 feet alongside. Arrangements may be made also to fuel from barges. Coal bunkers are no longer maintained in San Diego, but coal can be supplied by arrangement.

Fresh water may be had at the wharves or by water boat. The city water is satisfactory both for drinking and boiler purposes. Provisions and ship chandlers' stores may be had in San Diego.

There is a **chart agency** of the Coast and Geodetic Survey in San Diego.

Repairs.—There are no graving or floating dry docks in San Diego. There are, however, several marine railways equipped for the repair of small vessels. The largest one is of 1,200 tons capacity and takes vessels of 212 feet in length with drafts of 15 feet forward and 17 feet aft. Vessels up to 30-foot beam, 150-foot length, can be hauled out at two of the plants.

Communications.—San Diego has direct transcontinental railway connection, and has communications with points north and south by rail and coasting steamers. There are complete telegraph, telephone, and radio facilities. It is a port of call for many of the intercoastal steamship lines. Several aerial transport companies maintain regular air service with San Diego. The municipal airport is only 1 mile north of the municipal piers.

Ranges for compass adjustment.—See table in the appendix.

Port Series No. 13 Part 2 covers the port of San Diego.

Winds.—The prevailing winds are from the northwest and west; the heaviest, from the south and west in winter and early spring. The winds seldom exceed 30 miles per hour, and shipping is considered safe at all times.

Fogs occur occasionally, there being on the average about 20 dense fogs per year. These are mostly night fogs, and seldom occur between the hours of 9 a.m. and 6 p.m.

Storm warnings displays of the United States Weather Bureau are shown from the naval radio station on Point Loma; Broadway Pier; Coronado Hotel boathouse, and from the tower of the naval administration building on North Island. Day signals only are shown.

Coronado, a resort opposite San Diego, is of little commercial importance. It is connected to San Diego by passenger and automobile ferry. The Coronado Hotel is prominent from seaward and the southern tower is shown on the charts.

National City, on the eastern shore 3.5 miles southward of San Diego, has some waterborne commerce. There are a municipal pier used by fish packing plants and an oil company pier at which tankers can dock. There is rail connection with San Diego.

COAST FROM POINT LOMA TO NEWPORT BAY

(CHART 5101)

The stretch of coast between San Diego and San Pedro Bays has been extensively settled in recent years. There are numerous small towns or resorts along the beach, with buildings which show up well from seaward. Communication, however, is mainly by rail, air, and highway. There is at present (1941) little traffic by water to any point in this region except to Newport Bay which affords an improved entrance for moderate-sized vessels.

From Point Loma, the coast trends northward for 5.5 miles to the entrance of **Mission Bay,** a small lagoon full of shoals and of no importance. The entrance to the bay is obstructed by breakers at all times and by a fixed bridge which has a vertical clearance of 7 feet at MHW. It is seldom used.

Between Point Loma and Point La Jolla, the coastline is extremely rocky, and because of the possibility of uncharted rocks, coasting vessels should keep well to seaward of the kelp beds, which extend in places 2 miles offshore.

Mission Beach, just north of the entrance to Mission Bay, has an amusement beach with a roller coaster and prominent buildings, one of which is yellow ochre in color.

There is an aero beacon 1 mile northeastward of Mission Bay.

About 1.2 miles northward of Mission Bay is an amusement pier with a covered structure that is prominent.

The first high land northward, about 9 miles from Point Loma, is a rounding rocky point, 2 miles in length, the seaward termination of a spur from **Soledad Mountain,** 820 feet high. The southern end of this headland is called **False Point** and the northern end is named **Point La Jolla.** In the vicinity of Point La Jolla, rock cliffs, in which there are many caves, rise abruptly from the water to a height of 70 or 80 feet. The cottages and buildings at **La Jolla** and at **Pacific Beach,** on the north shore of Mission Bay, are prominent from seaward.

A **measured course** is situated northward of Point La Jolla. It is 1 nautical mile in length and the course is 000° true. Each range is marked by two steel towers. The line of sight intersects the level of the bridge of the average ship at a distance of 4 miles from the shore.

La Jolla has bus connections with San Diego. It is a resort city and has no waterborne commerce.

The tower of La Valencia Hotel at La Jolla is lighted with a cluster of fixed red neon lights, and it forms a good mark at night, being visible 10 miles offshore.

About 1 mile to the northward of La Jolla is situated the **Scripps Institute** devoted to research work in oceanography and marine biology. The institute maintains a concrete pier for observation purposes. Immediately northward of the Scripps Institute the bluffs rise to a height of about 300 feet, decreasing gradually for about 5 miles to the northward whence the bluff varies in height from 20 to 80 feet.

Del Mar about 7 miles northward from La Jolla, is a resort town with a pleasure pier extending out to the surf line. The hotel with many gables is prominent from the sea.

From Del Mar the coast extends northward for 31 miles to San Mateo Point, as a low flat table land with abrupt cliffs seaward, 60 to 130 feet high, with broad, low-water beaches. The table land is intersected by numerous steep valleys containing streams that are usually dry in the summer. In the northern portion the high mountain ridges of the interior approach much nearer the coast. This section of the coast is paralleled by the Pacific Highway and the Santa Fe Railroad.

Solana Beach, Cardiff-by-the-Sea, and **Encinitas** are small towns 9, 10, and 11 miles northward from Point La Jolla. There is an aero beacon, very prominent from seaward, about 1 mile northward from Encinitas. The aluminum colored stand pipe on the top of the ridge at **Leucadia** is also prominent.

Carlsbad, 20 miles northward of Point La Jolla, is a summer resort with several hotels. The tower of the San Diego Army and Navy Academy (shown on chart) is very distinctive: low white square tower on west end of building.

Oceanside, 22 miles northward of Point La Jolla, is a small town, the buildings of which are prominent from seaward. There is a pleasure pier built out to the surf line.

There is an aero beacon, prominent from seaward, and a landing field near **Fallbrook Junction,** 2 miles northward of Oceanside.

The bridge and trestle work of the railroad crossing **Santa Margarita River,** 3 miles northward of Oceanside, are also prominent.

San Onofre Mountain, 1,732 feet in elevation, lies 1 mile from the coast, 12 miles northwestward of Oceanside and 3 miles eastward of San Mateo Point.

San Mateo Point, terminating in cliffs about 60 feet high is the northern head at the mouth of San Mateo Creek. Both the **San Mateo** and **San Onofre Creeks** are crossed by trestleworks. From San Mateo Point to Dana Point, about 8 miles, the land is higher and more rugged, and is broken by the **San Juan Capistrano Valley** and **San Juan Creek** about 1.5 miles eastward of Dana Point. The railway and Pacific Highway run along the beach under the bluffs in this stretch of the coast to the San Juan Capistrano Valley.

There is an aero beacon, prominent from seaward, on San Mateo Point.

San Clemente, 2 miles northward of San Mateo Point, is a small town distributed over a large area. All the houses are white with red tiled roofs, which make the town conspicuous from seaward. There is a small pleasure pier at the town.

Dana Point, 54 miles northwestward of Point Loma, is the seaward end of a high ridge. The spur forming the point ends in a moderately bold sandstone cliff 220 feet high, with a precipitous broken face, and outlying rocks and ledges extend offshore for 350 yards. **San Juan Rock,** 10 feet high, is about 50 feet in extent and lies 340 yards southward of the highest point on the cliff.

There is an aero beacon, prominent from seaward, on the point.

San Juan Capistrano Anchorage, now seldom used, lies 116° from Dana Point, in about 5½ fathoms outside the kelp. Small vessels with local knowledge may anchor inside the kelp in 3 fathoms about 0.4 mile from the beach with Dana Point bearing 279°.

There are a pleasure pier and several prominent buildings along the beach.

San Juan Capistrano is a small town about 2.5 miles inland. It is the location of an old mission founded in 1776. Some of the buildings are still in a fair state of preservation.

From Dana Point to Newport Bay, a distance of 12 miles, the coast is bold, with rocky cliffs 40 to 100 feet high, which are the seaward ends of ridges transverse to the coast, separated by narrow, deep valleys. **Laguna Beach,** a summer resort with a small pleasure pier, lies midway along this stretch of coast.

Santiago Peak, 5,680 feet high, double-headed, and dark in contrast with the immediate coast range, is the dominant feature of this part of the coast. It lies about 17 miles northwestward of Dana Point and is visible about 80 miles.

NEWPORT BAY

(CHART 5108)

Newport Bay is an extensive lagoon which has undergone considerable improvement in recent years.

Landmarks.—An aero beacon is located on the high ground in back of Lido Island and about 0.8 mile back from the beach. About 1 mile back from the beach, in this same vicinity, is a light-colored concrete school building with a high tower. About 4 miles westward of the jetty, and on the high ground immediately back of the beach, rises a lone oil derrick, the west timbers of which have been painted white. A half mile northward of this derrick lies a group of concrete reservoir tanks surmounted by a tall black tank.

Channels.—The entrance to the bay lies between two jetties 900 feet apart. The light on the outer end of the eastern jetty is shown from a gray skeleton tower, 40 feet above water. The light on the outer end of the western jetty is shown from a black skeleton tower, 44 feet above water. A fog signal is sounded on an electric siren located on the western jetty tower. A lighted bell buoy is moored off the western jetty.

The project provides for an entrance channel 20 feet deep and 500 feet wide; a main channel 20 feet deep and generally 200 feet wide, from the entrance to the western end of the bay; a yacht anchorage 15 feet deep, 1,200 feet wide, and 1,700 feet long on the southern side of the main channel midway of the bay; a turning basin 20 feet deep, approximately 2,000 feet long and up to 1,000 feet wide at the western end of the bay. In 1941 full project dimensions were obtained except in the turning basin which had shoaled in the northeastern corner reducing the controlling depth to 15 feet. †In ---------- 19----, the controlling depths in the channel were:----------

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Anchorage.—The fishing and yachting fleets anchor in either the yacht anchorage basin or off the western end of town in the turning basin.

The outside anchorage is open, but good holding ground can be had westward of the pier at Newport Beach in 42 feet, sticky bottom, blue mud.

Wharves.—There are numerous small wharves and landings, practically all for fishing craft and yachts.

Balboa, Lido, Harbor, and **Bay Islands** are located in the bay.

Supplies.—Gasoline, water, provisions, and ship chandlery may be obtained.

There is a **chart agency** of the Coast and Geodetic Survey situated here.

Repairs.—There are facilities for repairing launches and small craft only.

Communication.—There is communication by rail, bus, and motor truck with the interior; also telegraph and telephone facilities. The city of **Santa Ana** is situated about 10 miles back from Newport Bay.

Winds.—Severe storms are rare. The "Santa Ana" is an exceptional wind from the northeast to eastward, that blows with great violence, although of short duration. See page 66.

Storm warnings are displayed from a tower at the shore end of the western jetty.

Corona Del Mar is located on the eastern side of the entrance to the bay.

Balboa is the eastern part of the peninsula separating Newport Bay from the sea. About 1 mile westward of the western jetty is a pier extending about 450 feet from the beach.

Newport Beach is a continuation westward of Balboa. At a distance of about 2.5 miles from the western jetty there is a pleasure pier with about 30 feet at its face.

The head of a **submarine valley** extending in a southerly direction, lies close off this pier. The bottom of this valley is green mud, whereas the ocean bottom is uniformly fine gray sand.

NEWPORT BAY TO SAN PEDRO BAY

(CHART 5101)

From Newport Bay to Point Fermin, nearly 20 miles, the coast is low with several lagoons in the vicinity of the beach. The country is treeless and has been largely built up in recent years. The towns and resorts along the beach are nearly continuous.

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

Huntington Beach lies about 5 miles northwestward of Newport Bay. There is a concrete fishing and pleasure pier located here, but no landing facilities. The city is identified by the numerous oil derricks.

Seal Beach is a city about 7 miles northwestward of Huntington Beach. There is a short pleasure pier with a small tower at its outer end, and numerous resort structures situated along the beach.

SAN PEDRO BAY

(CHART 5143)

San Pedro Bay extending from Seal Beach on the east to Point Fermin on the west, is about 92 miles northwestward of San Diego. On the bay are located the city of Long Beach and the port-portion of the city of Los Angeles. The districts of San Pedro and Wilmington form the port of Los Angeles.

Approaching from the southeastward, San Pedro Hill, Point Fermin Light, Los Angeles Harbor Light, aero beacon near the waterfront at Long Beach, Signal Hill, and the chimney at Seal Beach are prominent.

San Pedro Hill, 1,479 feet high, is a prominent landmark and the distinguishing feature for making San Pedro Bay from eastward or westward. It terminates seaward in steep, rocky cliffs about 60 feet high, with several horizontal terraces between them and the summit.

Point Fermin, the southeastern extremity of San Pedro Hill, is a bold cliff about 100 feet high. **Point Fermin Light** is shown from a white square tower on dwelling, situated near the end of the point. The light is 154 feet above high water and visible 18 miles.

A **radio direction-finder station** is located near the light.

A **rock,** with 3 feet over it, lies 0.25 mile 137° from Point Fermin Light and is marked by a whistle buoy moored about 0.5 mile 150° from the light.

Los Angeles Harbor Light is on the outer end of the breakwater extending from Point Fermin. It is 73 feet above water, visible 14 miles, and is shown from a white cylindrical tower with black pilasters on concrete block foundation; the fog signal is a two-toned air diaphone. There is a radio-beacon at the light equipped for distance finding.

The **aero beacon** on the waterfront of Long Beach is on the tower of a building 225 feet above water; the light is visible 17 miles.

Signal Hill rises to a height of 355 feet about 2 miles back from the beach, and is literally covered by oil derricks by which it is readily recognized.

A **high concrete chimney** from a power house at Seal Beach affords an excellent landmark along this section of the coast. It is flood-lighted at night and in clear weather is visible for 15 miles at sea in the daytime and 12 miles at night.

LOS ANGELES HARBOR

(CHART 5147)

The portion of San Pedro Bay lying just eastward of Point Fermin, which formerly afforded good shelter only in northerly or westerly winds, has been converted into a safe harbor in any weather by the construction of two breakwaters. The first extends in an easterly direction from the eastern end of Point Fermin for a distance of 1,900 yards, thence in a northeasterly direction a farther distance of 1,800 yards. The outer end of this breakwater is marked by Los Angeles Harbor Light. The second break-

water begins 755 yards 68½° from the light and extends northeasterly for 4,166 yards, thence eastward for 2,000 yards. The southwestern end is marked by **Los Angeles East Breakwater West End Light.** It is shown from a gray skeleton tower on concrete base, 42 feet above water; it is visible 12 miles. The fog signal is a diaphragm horn. A third and final breakwater is under construction. This section begins at the eastern side of the Long Beach Approach Channel and will extend about 2 miles in an easterly direction.

San Pedro and **Wilmington** have extensive traffic, both foreign and coastwise, with ample facilities for the largest vessels on the Pacific. Provision is being made to take care of extensive future increases in traffic.

Terminal (formerly **Rattlesnake**) **Island** separates Los Angeles inner harbor from from San Pedro Bay. The island has been extensively improved, and **East San Pedro,** opposite San Pedro, handles a considerable amount of the freight passing through the port.

Landmarks.—There are several prominent objects shown on the chart that may be of use to the navigator. A few of those most easily distinguished are listed below:

A black cylindrical tank bearing a large neon sign, "Ford", located on top of a large building near the Cerritos Channel bridge.

A tall concrete stack south of Fort McArthur, Lower Reservation.

A large stack of the Hammond Lumber Company near berth 225, inner harbor.

See Long Beach for additional landmarks, page 66.

A light is shown from a white house on pile structure southeastward of Pier 1, which is on the western side of the entrance to Main Channel. A fog signal is sounded on a siren. A light is shown from a red house on pile structure southeastward of Reservation Point which is on the eastern side of the entrance to Main Channel. A fog signal is sounded on a bell.

Channels.—The project provides for an **Entrance channel** 40 feet deep, 1,000 feet wide with a **Turning Basin,** which is 1,500 feet wide and 3,500 feet long; an **Inner Harbor channel** 35 feet deep and 1,000 feet wide, with a turning basin at Los Angeles Harbor 35 feet deep; the **East Basin channel,** from the turning basin for a distance of 1,150 yards with a depth of 35 feet and a width of 650 feet; **Cerritos channel,** connecting Los Angeles and Long Beach Harbors, 35 feet deep over a width of 400 feet. The channel leading to the West Basin is 30 feet.

In June 1941, the controlling depths were: 40 feet in the entrance channel and outer harbor turning basin; 35 feet in the main channel, inner harbor turning basin, east basin channel, Cerritos channel. †In _____ 19____, the controlling depths in the channel were: _____

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Fish Harbor, on the southern side of Terminal Island, near its western end, has been formed by dredging and by the construction of protecting breakwaters. A 20-foot channel has been dredged from the outer harbor to and along the sea wall along the northern side of the harbor. In April 1935, the controlling depth was 20 feet in Fish Harbor channel. This sea wall is lined with canneries and other fish works. This harbor is intended for the use of fishing craft, and each side of the entrance is marked by a light.

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

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There are two breakwaters enclosing Fish Harbor. The outer and newer one encloses the **Yacht Club Anchorage,** sometimes referred to as **Fish Harbor Extension,** which has depths up to 17 feet. The inner breakwater encloses Fish Harbor proper. There is a light just off the outer end of the new breakwater.

Pilotage.—Pilotage is compulsory except for vessels under 300 gross registered tons and all vessels under enrollment, and licensed, and engaged in coastwise and intercoastal trade between the ports of Los Angeles or Long Beach and any other port of the United States, while under the control and direction of a pilot duly licensed under Federal law.

Pilots.—Vessels are met outside and, if waiting for a pilot, anchor inside the breakwater. The pilot boat flies the Union Jack. The pilots are in the employ of the city of Los Angeles. A pilot station is maintained at the outer end of Pier 1. A signal for calling a pilot is one long and one short blast of the whistle.

Towboats.—There are towboats available for any kind of towing. Large vessels navigating the main channel usually have a towboat in attendance while berthing.

Quarantine.—Quarantine for the port of Los Angeles is enforced in accordance with the regulations of the United States Public Health Service. The quarantine station is located on **Reservation Point** on the eastern side of the entrance to the main channel.

Customs.—The customhouse is situated in the Post Office and Customhouse Building on Beacon Street between 8th and 9th Streets, San Pedro.

Immigration.—The United States immigration station for the port of Los Angeles is located at berth No. 72, on the western side of the main channel at the foot of Twenty-second Street, San Pedro.

Hospitals.—The United States Public Health Service maintains a relief station at the United States Post Office and Customhouse, San Pedro. The San Pedro General Hospital is at 1305 Sixth Street. There are also numerous public and private hospitals in the city of Los Angeles.

Anchorage.—The various anchorage areas are shown on chart 5147. Anchoring or mooring in any channel of the harbor is prohibited unless the vessel is securely moored both fore and aft. Anchoring or mooring in the Turning Basin is forbidden under all circumstances. The "Santa Ana," see page 66, is the only wind dangerous to vessels anchored inside the breakwater. If not provided with adequate ground tackle and sufficient swinging room for a long scope of chain, a vessel is liable to drag anchor. See "Surge" on page 63.

Quarantine Anchorage.—Vessels requiring examination by the quarantine, custom, or immigration authorities, will anchor in anchorage "H".

Explosive Anchorage.—Assignment of location in the Explosive Anchorage is made by the Captain of the Port.

Yacht and small craft anchorages.—The area westward of the ship channel adjacent to **Watchorn Basin** is used as a yacht anchorage. There are many mooring buoys in this vicinity. The northern part of west basin, the northern extremity of east basin, and the shoaler portions thereof are also used by pleasure craft. The yacht club anchorage is used for yachts and small boats.

Anchorage Regulations.—The rules and regulations for anchorages in general are given below. Complete regulations for all anchorage areas may be obtained from the Captain of the Port, the Harbor Master, and the District Engineer.

RULES AND REGULATIONS FOR ANCHORAGES IN GENERAL

1. Except in cases of great emergency, no vessel shall be anchored in the navigable waters of Los Angeles and Long Beach Harbors outside of the anchorage areas hereby defined and established.

2. Anchors must not be placed outside the anchorage areas, nor shall any portion of the hull or rigging at any time extend outside the boundaries of the anchorage areas.

3. Any vessel anchoring under circumstances of great emergency outside of the anchorage areas must be placed near the edge of the channel and in such position as not to interfere with free navigation of the channel nor obstruct the approach to any pier nor impede the movement of any boat, and shall move away immediately after the emergency ceases, or upon notification by the Captain of the Port.

4. No vessels, other than those of the United States Government, shall anchor in any of the established anchorage areas nor in any other areas within the outer Los Angeles-Long Beach Harbors, as defined by the limits of the San Pedro breakwater, the detached breakwater, and the Long Beach breakwater, nor closer than 1 mile to any point of said breakwaters in the waters seaward thereof, while carrying, loading, or unloading explosives in quantities in excess of 500 tons. Vessels engaged in the transportation of explosives in quantities of 500 tons or less may occupy that portion of anchorage "C" designated as "Explosives Anchorage", subject to the conditions stated in the note following the description of this anchorage, and in accordance with the rules and regulations.

5. The instructions of the Captain of the Port assigning vessels to parts of anchorage grounds suitable to their draft; requiring vessels to anchor bow and stern, or with two bow anchors, requiring shifting the anchorage of any vessel within any anchorage ground for the common safety or convenience; or for otherwise enforcing these rules and regulations; shall be promptly followed by owners, masters, and persons in charge of vessels.

6. Permission to anchor in the channels within the limits of Los Angeles and Long Beach Harbors may be granted by the Captain of the Port to plants or vessels engaged in recovering sunken property or in laying or repairing pipe or cable lines legally established, when approved by the United States district engineer, and to plants or vessels engaged in dredging operations when authorized by the district engineer. The provisions of this paragraph shall not apply to plants or vessels engaged under the supervision of the United States district engineer upon works for the improvement of the harbor, but the district engineer will advise the Captain of the Port in all cases where plant is to be employed under his supervision.

7. Nothing in these rules and regulations shall be construed as relieving the owner or person in charge of any vessel or plant from the penalties of the law for obstructing navigation or for obstructing or interfering with range lights, or for not complying with the navigation laws in regard to lights, fog signals, or for otherwise violating law.

Harbor Regulations.—Regulations for Los Angeles Harbor are prescribed by a board of harbor commissioners. Copies of the harbor regulations may be obtained from the Harbor Master.

Tides.—The mean range of tide in Los Angeles Harbor is 3.8 feet. The range between mean lower low water and mean higher high water is 5.4 feet. A range of about 9 feet may occur at time of maximum tides. Daily tide predictions for Los Angeles Harbor are given in the tide table, published annually in advance by the United States Coast and Geodetic Survey.

Currents.—The tidal currents follow the axis of the channel. These rarely exceed one knot and are generally negligible.

Surge.—Both Los Angeles and Long Beach Harbors are characterized by short period oscillations manifested by vertical and horizontal movements which are designated respectively as seiche and surge. The most persistent and conspicuous oscillation has a period of approximately one hour. At the entrances to the harbors, the hourly surge is very prominent, causing velocity variations which at times may be as great as a knot and which often over-come the lesser tidal current so that the current floods and ebbs at half hour intervals. Because of the more restricted channel the surge through the Narrows of the Long Beach Entrance usually reaches a greater velocity than through the San Pedro Entrance and the hourly variation may sometimes be 1½

knots or more. The hourly surge together with other oscillations of shorter period and of more irregular occurrence at times causes a very rapid change both in the height of the water and the velocity and direction of the current and may endanger vessels tied up at the piers. Pilots advise taut lines to reduce the effect of the surge.

Bridges.—No bridges cross the main ship channel. The channel leading to the western basin is crossed by a bascule railway bridge; horizontal clearance 148.5 feet; vertical clearance above MHW when closed, 4.9 feet. The Cerritos Channel is crossed by the **Henry Ford Boulevard Bridge,** a double-leaf bascule for railway and highway traffic; horizontal clearance 180 feet; vertical clearance above MHW when closed, 8.9 feet. The Henry Ford Bridge remains closed as follows: week days between 7 a. m. and 8:30 a. m. and between 4 p. m. and 5:30 p. m.; Saturdays between 7 a. m. and 8:30 a. m.; and between 12 noon and 1:30 p. m. There is a swing bridge close eastward of the Henry Ford Boulevard Bridge, which has a horizontal clearance of 80 feet and a vertical clearance of 5.3 feet at MHW when closed.

Bridge regulations.—Operation of the above bridges for passage of vessels is governed by the following extract from the rules and regulations of the War Department:

2. If the weather conditions are good and sound signals can be heard when a vessel approaches a drawbridge and desires to pass through the draw—

(*a*) The person in charge of such vessel desiring to pass shall cause to be sounded, within reasonable hearing distance of the bridge, repeating if necessary, and in time to give due notice to its operator, three long distinct blasts of a whistle, horn, or megaphone, or three loud and distinct strokes of a bell.

(*b*) When the draw of the bridge can be opened immediately, the draw tender shall reply by two long blasts followed by one short distinct blast of a whistle, horn, or megaphone, or by three loud and distinct strokes of a bell.

(*c*) When the draw of a bridge cannot be opened immediately, the draw tender shall reply by two long distinct blasts of a whistle, horn or megaphone or two distinct strokes of a bell. (This signal may be used by a vessel to countermand its signal to open draw.)

(*d*) When after a delay, as in 2 (*c*) the draw of the bridge can be opened and the vessel still desires to pass, the draw tender shall give the signal prescribed in 2 (*b*) above, viz., two long blasts followed by one short distinct blast of a whistle, horn or megaphone, or three loud and distinct strokes of a bell.

3. When weather conditions prevent hearing sound signals—

(*a*) The person in charge of a vessel desiring to pass shall swing a white lighted lantern or white flag, the former by night, the latter by day; the persons signaling to face the drawbridge and swing the lantern or flag in front of him at arm's length, in vertical circles.

(*b*) When the draw of the bridge can be opened immediately, the draw tender shall reply by raising and lowering a white lighted lantern or white flag, the former by night, the latter by day, the movement to be vertical.

(*c*) When the draw of the bridge cannot be opened immediately, the draw tender shall reply by swinging a red lighted lantern or red flag, the former by night, the latter by day; the person signaling to face the vessel and swing the lantern or flag in front of him at arm's length, in vertical circles. (This signal may also be used by a vessel to countermand its signal to open the draw.)

(*d*) When, after a delay, as in 3 (*c*) the draw of the bridge can be opened and the vessel still desires to pass, the draw tender shall give the signal described in 3 (*b*) above, viz., raising or lowering a lighted lantern or flag.

4. When fog prevails by day or by night the draw tender on giving signal (2 (*b*), 3 (*b*), or 3 (*d*) above) that draw will be opened, shall toll a bell continuously during the approach and passage of the vessels.

5. The draw shall be opened with the least possible delay, upon receiving the prescribed signal: *Provided,* That the draw span shall not be opened when a train is approaching so closely that it cannot safely be stopped before reaching the bridge, or when a passenger or mail train is approaching within sight or hearing of the operator of the draw span.

6. Trains, wagons, and other vehicles shall not be stopped on a drawbridge for the purpose of delaying its opening, nor shall water craft or vessels be so manipulated as to hinder or delay the operation of a draw span, but all passage over, through, or under a drawbridge shall be prompt, to prevent delay to either land or water traffic.

7. Tugboats, launches, barges, and other small and low craft shall lower their poles or masts whenever by so doing they can pass under the bridge and the bridge shall not be required to open for such boats, launches, barges, or other small or low craft.

Directions.—No directions are given. Chart 5147 is sufficient guide for entering Los Angeles Harbor.

Wharfage.—Wharfage is assessed at the municipal wharves at Los Angeles.

Wharves.—The wharves of Los Angeles have depths sufficient for the largest vessels. The East Channel in the Outer Harbor has 40 feet alongside the bulkhead.

Storage.—There are extensive warehouses located in Los Angeles Harbor.

Supplies.—Fuel oil, water, provisions, and ship chandlery can be had in any quantity. Fuel oil may be obtained from the oil docks or by barge service. While but few coal-burning vessels now make the port of Los Angeles, arrangements can be made for bunkering in the outer harbor. Electric power is available at all important waterfront facilities.

Lighterage.—There is practically no lighterage at the port of Los Angeles.

Wrecking and Salvage.—The port of Los Angeles is well equipped with wrecking and salvage facilities. There are a trained salvaging crew and a corps of expert divers in readiness at all times to render aid in any disaster to shipping along the west coast, Mexico, Gulf of California, and distant offshore localities.

Repairs.—The port is well equipped with marine repair plants, and repairs of any magnitude can be undertaken. The largest dry dock has a lifting power of 15,000 tons and will accommodate vessels 575 feet in length. There is a depth of 25 feet over the blocks at high water, ordinary spring tides. There are no graving docks.

Communications.—Los Angeles Harbor is a port of call for many lines of foreign, intercoastal, and coastwise steamers. There are rail connections with three transcontinental lines, and one standard-gage electric line. There are five commercial air lines in operation at Los Angeles and vicinity. The many paved highways furnish adequate bus and truck service to the surrounding territory. There are complete radio, telegraphic, and telephone facilities.

A **Coast and Geodetic Survey District Office** is located in room 1426 United States Post Office and Courthouse in Los Angeles, where complete files of the Coast and Geodetic Survey charts, coast pilots, tide tables, current tables, and other publications relating to navigation may be consulted, and information affecting navigation obtained without charge. The district office is also a sales agency for Coast and Geodetic Survey publications, including charts.

A **United States Branch Hydrographic Office** is located at 242 W. Seventh Street, San Pedro. Bulletins are posted here giving information of value to mariners, who can also avail themselves of publications pertaining to navigation and correct their charts from standards. No charge is made for this service.

A **United States Coast Guard Office** is located in the Post Office Building, Long Beach. This is the **Coast Guard District Headquarters** and the office of the **Captain of the Port.** See page 374.

Other Federal activities are given in the Appendix.

Port Series No. 13 Part 1 covers the port of Los Angeles.

There are **chart agencies** in San Pedro and Los Angeles.

The **Harbor Master's** office is located at Berth 88, First Street Wharf.

Ranges for compass adjustment are listed in the Appendix on page 373.

Yacht Clubs.—A list of the larger yacht clubs on the Pacific Coast is given in the Appendix.

Fog.—Fogs occur throughout the year, but most frequently during the early spring and fall months. Ordinarily they are of comparatively short duration, and occur during the night, clearing before 9 a. m. There have been times, however, when the fog has hung in the San Pedro Channel for several days. The outer harbor is usually clear of fog first, then the San Pedro Channel gradually clears.

Winds.—The prevailing winds during the summer are from the northwestward and in winter from the southward and westward; the heaviest winds for each season come from the prevailing direction. Southeasterly gales occur occasionally during the winter.

The only wind that is apt to be destructive is a local wind known as the "**Santa Ana**" or desert wind which comes from the northeastward. It is a warm, very dry wind, blowing furiously and ladened with great clouds of dust. It usually occurs with greatest force during the fall and winter and is most frequent during the night or early morning hours, especially the latter. An excessively low humidity, and a very high visibility for some hours before the desert storm reaches the coastline, are preliminary signs of its approach. A dark brown dust cloud coming from the northeastward gives a few minutes warning of its arrival. The barometer gives no warning. A "Santa Ana" can usually be predicted from weather maps made from current weather reports. When an area of very high barometric pressure develops over the plateau region of Nevada and northern Arizona with a relatively low area along the southern California coast, a steep barometric gradient is formed indicating winds from the northeastern quadrant.

Storm signals.—Day and night storm signals of the United States Weather Bureau are displayed from a steel tower on the roof of a concrete warehouse at the outer end of Municipal Pier No. 1 in the outer harbor. The Marine Exchange lookout light, maintained by the Los Angeles Chamber of Commerce, is a few feet below and close to the base of the tower and adjacent to the station occupied by local marine observers and Weather Bureau employees.

LONG BEACH HARBOR

(CHART 5147)

Long Beach Harbor occupies the eastern portion of San Pedro Bay. It is connected with Los Angeles Harbor by Cerritos Channel. The distance between the entrances to the two harbors over San Pedro Bay is only about 4 miles.

A **breakwater,** 7,300 feet long, has been constructed on the eastern side of the harbor which protects Long Beach entrance from the south and southeast and forms the outer harbor. The outer end of the breakwater is marked by **Long Beach Breakwater Light,** visible 13 miles, which is shown from a white skeleton tower 51 feet above water. The fog signal is sounded on an electric siren.

There is a jetty on the western side of outer harbor extending about 600 yards southward of the bulkhead, then turning to the east-northeastward for about 150 yards. Lights mark the turn and end of this jetty.

Landmarks.—An airway beacon is located on the Security First National Bank Building. It is 225 feet above the water and is visible 17 miles.

The four western stacks, 256 feet high, of the Southern California Edison Power Plant on the eastern end of Terminal Island, show prominently.

In the central business district of Long Beach are several buildings of prominence near the beach, namely, the Ocean Center Building with a yellow tower, near the foot of Pine Avenue; a yellow hotel tower one block eastward of Ocean Center Building; a conspicuous white stone tower 0.4 mile eastward of the latter.

Channels.—The approach channel, with a project depth of 45 feet, leads from the eastern breakwater to the entrance channel, to the inner harbor, with a project depth of 35 feet and a width of 300 to 500 feet, to a turning basin, 1,100 feet in diameter and a project depth of 40 feet.

In June 1941, the controlling depth in Long Beach entrance channel and the inner harbor turning basin was 35 feet.

Jetties on both sides of the channel to the inner harbor afford additional protection and prevent rapid silting.

Two channels have been dredged to 35 feet in the outer harbor to the wharves on the southern side of **Seaside Park.**

From the turning basin two channels have been dredged in a northeasterly direction for a distance of 0.7 mile, with depths varying from 32 to 40 feet.

†In _____ 19___, the controlling depths in the channels were:_____

_____

_____

Pilotage.—Pilotage is compulsory except for vessels under 200 gross registered tons and all vessels under enrollment and licensed and engaged in coastwise or intercoastal trade between the ports of Los Angeles or Long Beach and any other port of the United States, while under the control and direction of a pilot duly licensed under Federal law.

Pilots.—The pilots are in the employ of the city of Long Beach.

For the following items refer to Los Angeles on the page as indicated: **Towboats** on page 62; **Quarantine** on page 62; **Customs** on page 62; **Immigration** on page 62.

Hospitals see page 62; and the Seaside Hospital located on Fourteenth Street, near Pacific Avenue.

Anchorage for vessels is found in the outer harbor, which is protected by the breakwater and has excellent holding ground. The anchorage areas described under the port of Los Angeles on page 62 are also available.

Anchoring in the turning basin or any channel in the port of Long Beach is forbidden except in case of actual emergency.

Harbor Regulations.—The rules and regulations, as well as the tariff governing the operation of the port, are practically identical with those in force and effect in Los Angeles Harbor, and consequently no confusion arises by reason of the fact that vessels often have part cargo in both ports. The control of the harbor district is vested in a board of five harbor commissioners appointed by the city manager. Copies of these rules and regulations may be obtained from the harbor engineer's office.

Tides.—The mean range of tide in Long Beach Harbor is 3.7 feet. The range between mean lower low water and mean higher high water, diurnal range, is 5.3 feet. A range of about 9 feet may occur at times of maximum tides. Daily tide predictions for Los Angeles Harbor are given in the tide tables, published annually in advance by the United States Coast and Geodetic Survey, and may be computed for Long Beach by the use of the table of differences and ratios given in that publication.

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†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

Currents.—The tidal currents follow the axis of the channels. They rarely exceed 1 knot, and are generally negligible.

Surge.—Special attention is directed to this topic, described on page 63.

Bridges.—The Henry Ford Boulevard Bridge over the Cerritos Channel is a double-leaf bascule bridge for railway and highway traffic; horizontal clearance 180 feet; vertical clearance above MHW when closed 8.9 feet. Regulations pertaining to this bridge are given on page 64. There is a swing bridge close eastward of the Henry Ford Boulevard Bridge, which has a horizontal clearance of 80 feet and a vertical clearance of 5.3 feet at MHW when closed.

Aerial Cables.—Several power lines, approximate vertical clearance 200 feet, cross the Cerritos Channel near its eastern end.

Directions.—No directions are given. Chart 5147 is sufficient guide for entering Long Beach Harbor.

Wharfage is assessed at the municipal wharves.

Wharves.—Approximately 95% of the wharves in the inner harbor are privately owned, while those in the outer harbor are municipally owned. See Channels page 67.

Storage.—There are no storage warehouses nor grain elevators on the waterfront of Long Beach.

Supplies.—Fuel oil, water, provisions, and ship chandlery can be had in any quantity. Fuel oil may be had from the oil docks or by barge service. No coal for bunkering is available, but may be arranged for in Los Angeles outer harbor.

Lighterage.—There is practically no lighterage at this port.

Salvage and wrecking gear.—See Los Angeles page 65.

Repairs.—The port has a floating drydock of 2,500 tons capacity, with 16 feet over the blocks at high water, ordinary spring tides. The plant is well equipped to handle all kinds of repairs. There are also marine railways for small craft.

Communications.—While the ports of Los Angeles and Long Beach are separate entities, the traffic facilities are closely interrelated. See page 65.

For the following items refer to Los Angeles on pages 65 to 66: Government Offices, Port Series, Ranges for Compass adjustment, Fog, Winds, Santa Ana, and Storm Signals.

POINT FERMIN TO FLAT ROCK POINT

(CHART 5143)

From Point Fermin the coast trends in a general westerly direction about 6.5 miles to Point Vicente, the southwestern termination of San Pedro Hill, and forms the northern shore of San Pedro Channel, see page 71. Between Point Vicente and Flat Rock Point, the coast curves toward the northward. The coast is free of offlying dangers and is well marked by kelp.

A submarine sewer extends 4,978 feet from **Whites Point.**

Portuguese Bend, a small, unimportant bight, lies 2.3 miles eastward from Point Vicente. It is used chiefly by fishermen, and a boat landing can be made at times.

Point Vicente is a steep rocky cliff, 120 feet high, white and red in color, with the red predominating. A low, black rock, awash, lies 250 yards southwestward from the point, with kelp extending 100 yards farther. A small black, pyramidal rock, 25 feet high, lies 0.3 mile eastward of Point Vicente, close inshore.

Point Vicente Light*, on a white cylindrical tower, is 185 feet above water and visible 20 miles. The fog signal is sounded on a chime whistle.

*Lat. 33° 44′.5, Long. 118° 24′.7: Charts 5101, 5101A, 5143, 5002, 5020, 9000.

The Coast Guard maintains a radio station near the light.

Measured course.—A measured mile standardization course has been established at Point Vicente. The ranges are marked by beacons on shore which bear 34° 40′ when in line.

Palos Verdes Point, 2 miles northwestward of Point Vicente, is a bold bluff point, 120 feet high, rising rapidly to the western extremity of San Pedro Hill. There are no dangers off the point, but heavy kelp extends out about 0.6 mile.

Lunada Bay is a small bight on the southern side of Palos Verdes Point. **Resort Point** forms the southern side of this bay.

Flat Rock Point, 1.7 miles northeastward of Palos Verdes Point, forms the southern extremity of Santa Monica Bay. A narrow spur protrudes from the otherwise rounded point. **Flat Rock,** 6 feet above MHW, and **Bit Rock,** 5 feet above MHW, lie 175 yards and 250 yards respectively off the end of the spur.

Bluff Cove is a shallow bight on the southern side of Flat Rock Point. The beach is covered with boulders.

FLAT ROCK POINT TO SANTA MONICA

(CHART 5144)

From Flat Rock Point to Santa Monica the shore is comparatively low, consisting of sand dunes about 100 feet high, but backed by the high mountains of the Sierra Madre far in the interior. The shores of Santa Monica Bay are free of outlying dangers, and the soundings are comparatively shoal, the 10-fathom curve lying as a rule a distance of about 1 mile from the shore, except at Redondo Beach, where a deep submarine valley, **Redondo Canyon,** heads close to the shore and a depth of 10 fathoms is found 400 yards from the beach.

Landmarks.—There are several prominent objects in this vicinity. About 1 mile northward of Redondo Beach and about 200 yards inshore is a large abandoned power house with three huge smokestacks placed in a line normal to the beach. On Hermosa Beach there is a 7-story white concrete beach club, surmounted by an elevator penthouse. An aluminum water tank is on the southern pleasure pier at Venice.

Numerous white tanks and several smokestacks, topped by one much taller than the others, all lying within the extensive oil refinery area in El Segundo, can readily be seen from seaward. In the city of Santa Monica an aluminum-painted gas holder and a terra-cotta office building, surmounted by a tower upon which blazes a huge neon sign, afford excellent landmarks.

Malaga Cove, just northward of Flat Rock Point, sometimes used by small vessels with local knowledge, affords shelter from all but westerly and southwesterly winds, with which a heavy swell sets in. There is a break in the kelp through which vessels enter and anchor inside in 6 to 7 fathoms, with the south point of the bight bearing 207°.

Redondo Beach is situated 6 miles northward of Point Vicente. Gasoline and fresh water may be obtained by small craft alongside a wharf situated immediately southward of the fishing pier. A yacht basin, with anchorage area protected by a breakwater, is under construction northward of the municipal fishing pier.

Submarine oil seepage.—At the head of a deep submarine valley, about 1.5 miles off Redondo, the water has occasionally been noticed to be covered with petroleum, the results of submarine seepage. Gas bubbles have been reported in several locations in this vicinity.

A second seepage 3.5 to 4 miles to the northwestward is more noticeable and more continuous in action. Globules and large blobs of oil have been seen projected clear of the water surface on calm days. Gas also escapes continuously in large bubbles often 3 to 6 inches in diameter.

Hermosa Beach is a resort town with a pleasure pier about 1.5 miles northward of Redondo Beach.

Manhattan Beach is another resort town northward from Redondo Beach. Between Redondo Beach and Manhattan Beach development of beach property has been so extensive that it is impossible to distinguish the dividing lines between the towns. There is a pleasure pier at Manhattan Beach.

About 2 miles northward of Manhattan Beach is an oil-loading wharf built out to a depth of 28 feet. About 1,100 yards westward of this wharf is the terminus of the heavy oil submarine pipe line. A second submarine pipe line for lighter grades of oil is situated about 1,200 yards 284° from the wharf. There are five mooring buoys in the vicinity of the end of each of the pipe lines and the wharf, and a bell buoy farther offshore. The larger tankers are handled offshore and the smaller ones at the wharf. A foghorn is maintained by the oil company at the end of this wharf.

El Segundo is situated about 1 mile back from the oil wharf. The city has extensive oil refineries. Nearly 100 large white oil tanks located on the high ground are prominent.

Airway beacon.—There is an airway beacon in El Segundo about 2.5 miles from the beach.

Nearly a mile northward of the oil-loading wharf, at **Hyperion,** is a pier carrying an outfall sewer of the city of Los Angeles; it is built out to 26 feet. Immediately inshore from the pier is the purification works consisting of a large brick building. Just northward of this wharf is a second sewer outfall which extends 5,000 feet seaward. The turbulence of the discharge is often noticeable, especially in relatively calm seas, so the end of the sewer is readily avoided.

Playa Del Rey, at the southern end of **Ballona Lagoon,** is the scene of considerable real-estate development. The town is conspicuous on account of the completeness of its street pavement, sidewalks, and curbs.

Venice, situated at the northern end of the lagoon, was built as a resort town, but within recent years a large number of oil wells have been drilled along the beach in the southern portion of the town. There are two large pleasure piers with buildings, chutes, and domes that are conspicuous from the sea. Gasoline and water for small craft may be obtained here. Venice is a part of the city of Los Angeles.

Santa Monica is a city and seaside resort of importance. The buildings and structures along the beach are prominent from seaward. There is a large pleasure pier here, but no water commerce. The pier is built out to about 22 feet; fuel oil, distillate, and gasoline are available. A breakwater, with a light at each end, 2,000 feet long and extending parallel to the beach, is 600 feet beyond the outer end of the pier.

Santa Monica Light* is shown from a white lookout tower on Santa Monica Wharf. It is 95 feet above water, and visible 16 miles. The fog signal, at the end of the wharf, is sounded on an air diaphone.

Airway beacon.—There is an airway beacon at the **Clover Field Airport,** Santa Monica, 2.2 miles from the beach.

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*Lat. 34°00′.5, Long. 118°29′.8: Charts 5101, 5101A, 5144, 5002, 5020, 9000.

SANTA MONICA TO POINT DUME

(CHART 5101)

The coast from Santa Monica to Point Dume is bold, rocky, and rugged, with steep cliffs rising abruptly from the water's edge, thence gradually in 3 or 4 miles, to the summits of the Santa Monica Mountain Range, about 3,000 feet high, the seaward termination of which is at Point Mugu 14 miles westward of Point Dume.

Kellers Shelter, 7 miles northeastward of Point Dume, is an open bight which affords protection from northerly and westerly winds in 5 to 7 fathoms, sandy bottom. A reef, marked by kelp, extends a short distance offshore about 0.5 mile westward of the anchorage.

An improved highway extends along the beach on this section of the coast. Head lights of automobiles standing near the highway frequently are directed toward the sea.

Dume Cove, about 2 miles northeastward of Point Dume, affords protection similar to Kellers Shelter. The anchorage is abreast the fourth break or arroyo in the cliffs from Point Dume. It is immediately outside the kelp line, in 6 to 7 fathoms, sand bottom, with Point Dume bearing 240°. A high railway trestle crosses this gulch and the grade of the road slopes gradually to the beach eastward from it. Kelp should be avoided on account of possible dangers.

Point Dume* is the seaward end of a rather low plateau that terminates in a dome-shaped head, 200 feet high, rising from a bold rocky bluff. The bluff is reddish, with white cliffs eastward and westward. There is a small rock visible at all stages of the tide, lying 150 yards southward of the point, and a reef which bares at low tide 150 yards farther out. A lighted whistle buoy is moored 0.5 mile off the point and vessels must not go inside of it.

Mugu Canyon is a submarine valley with extremely steep slopes running about ¼ mile offshore from Point Dume, and extending northward roughly parallel to the beach. Moderately strong currents of a confused directional nature have been observed in the vicinity of this submarine valley.

OFFSHORE CHANNELS

(CHART 5101)

San Pedro Channel, 17 miles wide, lies between the mainland, Point Fermin to Point Vicente, and Santa Catalina Island.

Currents have been observed 5 miles south of Los Angeles Harbor Breakwater. Two periodic currents occur at this location; a tidal current, and a daily current apparently due to a land and sea breeze. Both are rotary, turning clockwise, and each is weak, having a velocity at strength of about 0.25 knot. The tidal current is very complicated; but the daily current is simple, maintaining on the average an approximately constant velocity and shifting direction to the right about 15° each hour. It sets 0° about 9 a. m., 90° at 3 p. m., 180° at 9 p. m., and 270° at 3 a. m.

Currents due to winds and oceanic drifts vary in velocity and direction. The average current for the five-month period, sets 112° with a velocity of about 0.1 knot. Currents greater than one knot occur infrequently. The greatest velocity measured during five months of observations was 1.5 knots.

Outer Santa Barbara Passage is between Santa Catalina and San Clemente Islands.

*Lat. 34°00′.0, Long. 118°48′.3: Chart 5101, 5101A, 5202, 5002, 5020, 9000.

OFFSHORE ISLANDS

(CHART 5101)

SAN NICOLAS ISLAND

(CHART 5113)

San Nicolas Island lies 53 miles off the nearest point of the coast and is the outermost island of the group. It is 43 miles westward of San Clemente and 24 miles southwestward of Santa Barbara Island. It is 8 miles long in an easterly direction, with an average width of about 3 miles. The highest point is 890 feet and the island is visible about 38 miles. From a distance, the island has a gently rounding profile, and there are no features that can be identified for taking bearings. The western part of the island is covered with sand, some of which has drifted to the middle northern shore. The remainder of the island is cut by deep arroyos and the top of the mesa is spotted with patches of burr clover and bunch grass from which about 2,000 head of sheep eke out an existence. With the exception of the rocky points, the island beaches are all sand. The island is practically surrounded by kelp. At the western end of the island the kelp extends westward about 3 miles, covering very irregular bottom. Two reefs lie in the kelp extending about 1.6 miles westward from the western extremity of the island. In thick weather great caution must be exercised in approaching from westward, and vessels should in no case pass inside the kelp. No dangers are known to exist outside the kelp.

Begg Rock, 15 feet high, lies 8 miles northwestward of the western point of San Nicolas Island, and is visible about 10 miles in clear weather. There is a reef extending northward and southward of it a little over 100 yards in each direction. The rock rises abruptly from 50 fathoms close-to. A lighted whistle buoy is moored about 500 yards northward of the rock.

A bank with 30 to 40 fathoms over it extends 7 miles eastward from the eastern point of the island. From the 40-fathom curve, the depths increase rapidly to the eastward and southward.

An indifferent anchorage may be had on the southern side of the sand spit (0.6 mile in length) on the eastern end of the island. Small craft anchor in 8 fathoms, hard sand bottom, near the inshore edge of the kelp. Larger vessels anchor farther off shore in 10 to 17 fathoms, hard sand bottom. The anchorage is often uncomfortable as the island tends to split the westerly seas and they break with equal force on both sides and meet off the end of the spit in a maelstrom of breakers. This condition tends to move the sand from the western end of the island and build up the sand spit. After sunset there is frequently a strong wind blowing off the mesa, making holding difficult. In a blow, local fishermen are in the habit of leaving this anchorage, considering the anchorage at Santa Barbara Island much the better of the two. A landing can usually be made during the summer months without difficulty at the eastern end on the southern side of the island.

San Nicolas Island Light*, unwatched, 564 feet above the water, is on the headland at the easterly end of the island. It is shown from a white structure and is visible 12 miles.

San Nicolas East End Light is shown from a white skeleton tower located on the sandspit at east end of the island. It is 25 feet above water and is visible 7 miles.

* Lat. 33°13′.7 Long. 119°26′.9: Charts 5101, 5101A, 5202, 5113, 5002, 5020, 9000.

San Nicholas North Side Light is located on the northern side of the island, nearly 3 miles from the eastern end. It is 33 feet high, on a white skeleton tower, and is visible 7 miles.

San Nicholas South Side Light is located on the south side of the island, about 2.5 miles from its eastern end, on a white skeleton tower. It is 50 feet high and is visible 7 miles.

Anyone using these lights should note the sectors through which they show. These are indicated on the chart.

A bank (Chart 5101), with depths from 52 to 70 fathoms over it, lies 20 miles southward from the eastern point of the island. The bank extends 9 miles in a northwesterly direction, and has an average width of 2 miles. The least depth that has been found was 52 fathoms. The bottom is hard with fine gray sand and shells. This bank is fished extensively during the winter season.

SANTA BARBARA ISLAND

(CHART 5110)

Santa Barbara Island lies about 21 miles westward from the western end of Santa Catalina Island; it is about 1.5 miles long in a northerly direction, with a greatest width of about 1 mile. The profile of the island is saddle-shaped, and at a considerable distance it appears as two islands. The greatest elevation is 635 feet on the southern side of the saddle, and the island is visible for over 25 miles in clear weather. The shores are bold and precipitous, and well marked by kelp, which extends to about 10 fathoms at irregular distances from the shore. Westward, the kelp makes out for over a mile, covering very irregular bottom, with a sunken rock near the outer and southern edge of the kelp. The water around the island is deep except where the kelp indicates foul or rocky bottom. A rocky islet, 300 feet high, known as **Sutil Island,** surrounded by kelp, lies about 0.5 mile westward from the southern point of the island; its northern face is steep. A smaller rock, 145 feet high, lies 200 yards offshore about 0.2 mile westward from the northern point of the island.

A fair anchorage for small craft in the prevailing westerly weather may be had off the eastern side of the island about 700 yards southeastward of the northeastern point. Large vessels can anchor off the eastern side of the island within the 30-fathom curve with hard gray sand bottom.

Santa Barbara Island Light, unwatched, 195 feet above sea level, is on the northern extremity of the island. It is shown from a white structure, and is visible 11 miles.

Santa Barbara Island South End Light, unwatched, 486 feet above sea level, is on the westerly part of the southern end of the island. It is shown from a white structure, and is visible 12 miles.

Certain sectors of each of these lights are obscured by the land. Refer to chart.

Osborn Bank (Chart 5101), 7 miles southward of Santa Barbara Island, is 5 miles long in a northwesterly direction, and has an average width of a little over 1 mile. The least depth found on the bank is 19 fathoms.

About 16 miles 335° from the northern extremity of Santa Barbara Island is located a submerged pinnacle rock of very small area on which a least depth of 17 fathoms was found.

SAN CLEMENTE ISLAND

NAVAL RESERVATION

(CHART 5111)

Warning.—San Clemente Island is a U. S. Naval Reservation and is closed to the public. Vessels, except those authorized by the Secretary of the Navy, are prohibited from approaching within one nautical mile of the low water line of the island.

Caution.—Vessels are warned that the vicinity of this island may be dangerous at any time on account of naval activities, such as gunfire and bombing. This warning notice applies to yachts and fishing vessels, as well as to other vessels.

Local magnetic attraction.—Compass deviations of from 1° to 3° from the normal, have been noted in the vicinity of San Clemente Island.

Seen from a distance, the top of San Clemente appears as a tableland and presents no definite natural features of value to navigation. Such structures as are shown on the charts may be identified by their locations and descriptive notes given at their positions.

The northeastern side of the island is bold, with rocky cliffs. The water is generally deep close inshore, and kelp grows close to the beach. On this side of the island, about 6 miles northwestward of Pyramid Head, a prominent white rock lies close inshore. On the beach inside this rock is a spring of fresh water, which is the only one available during the dry season.

The southwestern side of the island is more irregular, but is lower and has more gentle slopes. The kelp here extends several hundred yards offshore, generally to or beyond the 10-fathom curve. The rocks close inshore and inside of the kelp are numerous, but outside of the kelp line the slope of the bottom is more gradual than on the other side of the island and there are many places where vessels might safely anchor in the lee of the island during the northeastern storms, known as "Santa Anas".

Seal Cove, located on the southwestern side of the island, midway between the two ends, affords a boat landing and an indifferent anchorage for small craft in northwesterly weather.

PYRAMID COVE

(Naval Reservation, see above.)

(CHART 5117)

Pyramid Head, the eastern point of San Clemente Island, is about 900 feet high, sharp, and jagged; it is a prominent feature in making the island. It is marked by a light shown from a white structure, 226 feet above the sea, and is visible 12 miles.

Pyramid Cove Buoy, 1 mile southwestward from **Pyramid Head Light,** marks the southern limit of a rocky shoal.

The southwestern extremity of San Clemente Island is known as **China Point.** It is marked by **China Point Light,** shown from a white structure; the light is unwatched, 112 feet above sea level, and visible 11 miles.

The deep bight in the southern end of the island is known as **Pyramid (Smuggler) Cove.** The cove affords protected anchorage during northwesterly weather, in depths of 10 fathoms or in greater depths. Vessels should not enter the kelp as several dangers

have been located and are shown on the charts, and there are indications of other dangers. Some swell runs most of the time, but landing on the beach is usually not difficult.

Pyramid Cove Light* is located near the head of the cove. It is 96 feet above the sea, shown from a white pyramidal structure, and is visible 8 miles.

SAN CLEMENTE ISLAND, NORTHERN PART

(Naval Reservation, see page 74.)

(CHART 5118)

Wilson Cove, on the northeastern shore, about 2.5 miles southeastward of Northwest Harbor, is a fair anchorage in the prevailing westerly weather, but is uncomfortable at times as the swells make around the point from the northwestward. A strong wind usually blows down off the hills in the afternoon.

The U. S. Navy has a steel pier in the middle of the cove extending 550 feet from shore and having a landing section at its outboard end 38 feet wide by 210 feet long, with its deck 18 feet above MLLW. There is a 7½-ton crane at its outer end. Depths at MLLW along the landing section vary from 14 feet inboard to 24 feet outboard. Two fixed breast moorings are in place on each side opposite the landing section and should be used to avoid danger of damage from surge.

The best anchorage for small craft is in the lee of the kelp making off from a point nearly a mile northwestward of the wharf.

The buildings on the hill overlooking the cove are prominent from the southeastward.

Tide.—Time of tide is 5 minutes later than Los Angeles; mean range is 3.5 feet.

Wilson Cove Light is on a white pyramidal structure located on the shoulder of the hill on the southern side of Wilson Cove. It is 125 feet above the sea and is visible 11 miles.

Wilson Cove Range Lights are maintained by the U. S. Navy. They consist of a light near the outer end of the pier, 27 feet above the water, and another light on roof of house located 210 yards 198° from the front light. The rear range light is 13 feet higher than the front light. The bearing of the range coincides with the bearing of the axis of the pier.

Navy Anchorage South End Light is on a white pyramidal structure, located a little over 2 miles southward of Wilson Cove; the light is 140 feet above water and is visible 11 miles.

Wilson Cove North End Light is on a white skeleton tower, located about 1 mile northward of the cove; the light is 60 feet above water and is visible 10 miles.

Measured trial course.—A measured nautical mile, course 326° true, has been established off Northwest Harbor. Range towers on the northern end of San Clemente Island mark the ends of the measured mile.

Northwest Harbor, on the northwestern end of the island, affords shelter in southerly weather and is a comfortable anchorage in the prevailing westerly weather, as the large beds of kelp and the low islet to the northward of the anchorage afford protection. It is open northward, and is unsafe in heavy northwesterly weather. The bottom is sandy and the kelp extends to about 12 fathoms.

San Clemente Island Light, unwatched, 202 feet above water, visible 12 miles, is on the headland at the north end of the island.

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* Lat. 32° 49′.3, Long. 118° 23′. 7: Charts 5101, 5101A, 5117.

Westward from the northwestern end of the island there extends a line of rocks terminating about 0.5 mile off the point in a bold rocky islet, known locally as **Castle Rock.** This islet is 72 feet high and is prominent in approaching from the northeastward or southwestward.

Santa Ana Winds.—Shelter from these winds may be had off the southwestern side of San Clemente Island, just southward of **West Cove.**

SANTA CATALINA ISLAND

(CHART 5112)

The features of **Santa Catalina Island** of most interest to the local navigator, i.e., Avalon Bay, Isthmus Cove, and Catalina Harbor are shown on a large scale chart, No. 5128, and are described under that heading on page 77.

Santa Catalina Island lies 18 miles southward of Point Fermin. It is about 18.5 miles long in a southeasterly direction, with a greatest width of about 7 miles. About 6 miles from the western end is a deep cut running in a northerly direction which almost divides the island in two. The coves on each side of the island formed by this cut are less than 0.5 mile apart at their heads, the land separating them being a low isthmus, so that at a distance of a few miles the island appears as two. The island is rugged and mountainous, with steep, precipitous shores, intersected occasionally by deep gulches and valleys, and is covered with a thick growth of brush and some scrub oak. The highest peak, 2,107 feet, lies about in the middle of the eastern part of the island. Sheep and cattle are raised to some extent. Much of the northern side is free from kelp, but the southern side generally has a narrow fringe of kelp close-in to the beach. The island rises abruptly from deep water, the 30-fathom curve lying close inshore.

Most of the dangers in approaching the island are close inshore, within the kelp.

Catalina Island East End Light, unwatched, is shown from a white structure near the eastern end of the island; the light is 212 feet above the water and is visible 10 miles.

Catalina Island West End Light*, unwatched, is on the westerly point of the island and is shown from a white structure; the light is 76 feet above the water, and is visible 12 miles.

Ribbon Rock (Bulls Head), on the southern side of Santa Catalina Island, about 3 miles from the western end, presents a dark vertical rock wall with a giant ribbon of quartz veining, which is visible at a distance of many miles.

Farnsworth Bank, 5 miles southward of Catalina Harbor, and 1.5 miles offshore, has a least charted depth of 8 fathoms.

Shelter from "Santa Ana" winds may be had by anchoring in the bight near the **Palisades** on the southern side of the island, and 2 to 3 miles northwestward of the southern extremity.

There are two prominent rock quarries on the eastern side of the island; one located about 1.5 miles southward of Avalon Bay, and the other about 1 mile southeastward of Isthmus Cove.

White Cove, 3.5 miles nortwestward of Avalon, affords an anchorage in 8 fathoms; the protection is similar to that at Avalon. (See next section.)

Long Point Light is on a small white structure on Long Point, 4 miles northwestward from Avalon. The light is 71 feet above water and is visible 12 miles.

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*Lat. 33° 28′.7, Long. 118°_36′.3: Charts 5101, 5101A, 5112.

AVALON BAY, ISTHMUS COVE, AND CATALINA HARBOR

(CHART 5128)

Avalon Bay, sometimes known as **Dakin Cove,** is on the northern shore of the island, about 2.5 miles from its southeastern extremity. It is small and affords indifferent anchorage in 8 fathoms, sandy bottom. There is a depth of 20 fathoms immediately outside the points of the cove. The shelter is good in southwesterly weather, and fair in northwesterly weather if the wind is not too strong. The anchorage is not safe during the "Santa Ana" winds that occasionally blow from the eastward during the fall and winter months.

An electric **fog siren** is located on the pump house on the southeastern side of the bay, but is sounded only upon the approach of regular scheduled passenger steamers.

A large, white, circular concrete building, on the north side of the bay, is brilliantly illuminated for about half the night. **The Carillon,** a white concrete tower, is illuminated and is easily identified.

The village of **Avalon** is an extensive resort and is the principal settlement on the island. There are several wharves here, and daily steamer and airplane service with San Pedro. A road has been cut along the beach some distance on each side of the cove, and at night the lights along this road appear prominent from San Pedro Channel. The cove is important as a yacht anchorage and as a vacation resort. The usual yachting and fishing boat supplies are available.

There is a seaplane landing at **Hamilton Beach,** about 0.4 mile northward of **Casino Point.**

Isthmus Cove, on the north shore, 6 miles eastward of the western end of the island, affords shelter for small vessels in southerly weather, but is dangerous in northwesterly weather. A wharf has been built out to 17 feet at MLLW. and there are several prominent buildings on shore. There is an automobile road to Avalon, and during the tourist season, there is a launch service to that point.

Anchorage Regulations, Isthmus Cove: General Anchorage.—All of the navigable waters of Isthmus Cove shoreward of a line connecting the promontories known as **Lion Head** and **Blue Cavern Point,** except the zone of Restricted Anchorage. **Restricted Anchorage area,** is shown on Chart 5128. It consists of a zone 300 feet wide, extending for 1,200 feet seaward from the end of the wharf. No vessels are allowed to anchor in it.

The approach alongshore from the eastward is clear, but westward of the cove entrance is **Eagle Reef** which has a least depth of 3 feet at MLLW.; it is marked by growing kelp, and by a buoy located about 100 yards to the eastward. In approaching from the northward, **Ship Rock** is the guide. It is located about 1 mile northward of the cove, is 66 feet high, and is marked by a light shown from a small white structure; the light is 60 feet above the water, and visible 11 miles. The rock shows up as a black haystack from the channel, and the top is generally white with bird droppings. A reef extends about 120 yards southward of Ship Rock ending in a rock which bares 3 feet at MLLW.

Bird Rock, 37 feet high, and about 150 yards long, lies about 500 yards off the beach in the eastern part of the entrance to the cove; it is covered with sand and grass. Reefs extend off Bird Rock in places over 100 yards but it may be approached close-to on the eastern side.

Harbor Reefs, 400 yards southwestward of Bird Rock, are 350 yards long in a northwesterly direction, and less than 100 yards wide. They are generally well marked by kelp, and at MLLW. a rock near the eastern end bares about 2 feet. There is a buoy

just southward of the eastern end of the reef, and a buoy westward of the western end.

Fisherman Cove is a small cove in the eastern part of the bight; it is only available for small craft and is little used.

Catalina Harbor, on the southern side of the isthmus, separating it from Isthmus Cove, affords shelter, except in southerly weather, for small vessels. It is funnel-shaped, open to the southward, free from hidden dangers, and easy of access. **Pin Rock** is a small rock above water lying close inside the eastern head; it is about 100 yards offshore with deep water around it. The anchorage is in 4 to 5 fathoms, soft bottom, abreast the long, low point on the eastern shore, known as **Ballast Point.** The head of the harbor is shoal. The 3-fathom curve is marked by kelp, and vessels entering should give the shores a berth of 150 yards.

Chapter 5.—SANTA MONICA BAY TO POINT ARGUELLO

(CHART 5202)

OFFSHORE CHANNELS

(CHART 5202)

The offshore channels are taken up in the following order: Santa Barbara Channel; San Miguel Passage; Santa Cruz Channel; and Anacapa Passage. The description of the Santa Barbara Islands and the coast follows in that order.

SANTA BARBARA CHANNEL

(CHART 5202)

Santa Barbara Channel is about 63 miles long and varies in width from 11 to 23 miles, increasing gradually in width to the westward end. The passage is free of dangers and has a deep channel with depths of from 41 to over 340 fathoms along the main steamer track.

The mainland between Point Hueneme and Point Conception forms the northern shore of the channel, and the Santa Barbara Islands, which lie to the southward and break the force of the heavy westerly swell of the Pacific, afford a lee in winter from the full force of the southeasterly gales.

The eastern entrance to Santa Barbara Channel is 11 miles wide with a clear width in the middle of the passage of about 2 miles between the 20-fathom curves, and lies between Anacapa Island and Point Hueneme. The northern side of the channel at the entrance is particularly characterized by a deep submarine valley, **Hueneme Canyon,** which extends for about 1¼ miles in a south-southwesterly direction from Point Hueneme. There is a lighthouse and a radio direction finder station on this point, and a lighthouse and radiobeacon on the eastern end of Anacapa Island. A fog signal operates at both lighthouses.

The light on Santa Barbara Point is a prominent aid to navigation about midway through the channel.

The western entrance to the channel lies between Richardson Rock and Point Conception; the latter is marked by a light and the former by a lighted whistle buoy. The lighthouse and radiobeacon at Point Arguello are aids in approaching this entrance.

Winds.—The prevailing winds are westerly and blow nearly every day, especially in the afternoon. Southeasterly storms occur in the winter months; at times the sea becomes too rough to permit the passage of small vessels.

In the summer months, the winds in the channel are wholly different from those outside the islands and off the coast to the northwestward. Under the northern shore, which is protected by the bold range of the Santa Ynez Mountains, the westerly winds do not reach far eastward of Point Conception with much strength but are felt toward the islands, a strong northwesterly wind and heavy swell coming in from the open ocean. The climate in the Santa Barbara Channel, because of this blocking of the winds, is much

milder than to the northward along the coast. During heavy northwesterly weather, strong squally winds draw down the canyons which lie between Point Conception and Capitan and pass directly offshore, causing a severe choppy sea. Heavy northwesterly gales are often encountered off Point Conception on coming through Santa Barbara Channel, and great changes of climatic and meteorological conditions are experienced, the transition often being remarkably sudden and well defined.

In the fall and winter months, at and near the eastern end of the passage, stiff "Northeasters" are occasionally experienced. They come up without warning, usually at night in clear dry weather, and when the barometer is either high or rising rapidly. At such times small boats should be prepared to seek shelter at a moment's notice.

Fog.—During the summer season heavy fogs are a common occurence in the Santa Barbara Channel and envelope the main shore, channel, and islands. Not infrequently the mainland and channel are clear or moderately clear, while the islands alone are hidden. Sometimes all are clear during the day, but wrapped in dense wet fog at night. This condition, the fog lying offshore during the day and enveloping the land at night, is characteristic of the whole southern California coast. The fogs exist mostly during calm weather and light winds, and are generally dissipated by the strong northwesterly winds.

Currents.—The currents through Santa Barbara Channel are somewhat variable and have not been particularly examined. Navigators should not neglect to continually fix their position in making this passage. It has been reported that the general set of the current is easterly due to the prevailing westerly winds.

It has been observed that a strong inshore set prevails on a rising tide in the deep waters of the submarine valley off Point Hueneme at the eastern entrance to the channel. In general, there are conflicting currents, at times quite strong, around the slopes of the submarine valleys both here and off Point Mugu, with a general easterly set at the latter place.

The tidal current at strength of flood sets 310° with an average velocity of 0.5 knot off Hueneme Light. At Santa Barbara it sets 270° with an average velocity of 0.4 knot.

The offshore current, flowing south-southeasterly along the outer coast, with an estimated velocity of 0.75 knot, though greatly influenced by the winds, bends southward and westward off Point Conception. In heavy northwesterly weather, the current and heavy swells make into the southern side of the western entrance to the channel and along the northern shore of San Miguel Island. Off Point Conception light, at strength of flood, the tidal current sets 320° with an average velocity of 1.3 knots.

Vessels bound between San Diego or Los Angeles and northern ports use Santa Barbara Channel.

SAN MIGUEL PASSAGE

(CHART 5116)

San Miguel Passage, between Santa Rosa and San Miguel Islands is about 2.5 miles wide between the ledges which project from Sandy Point and Cardwell Point, the opposite points of the two islands. There is much broken water with many current rips in the vicinity of these ledges. To avoid Talcott Shoal (described on page 84) vessels using this passage should not allow the outer rock off the western point of Santa Rosa Island to bear southward of 184°. Sailing vessels should avoid this passage as the light airs and calms under the lee of San Miguel Island and the currents frequently combine to set a vessel toward Talcott Shoal.

The currents in the vicinity of the islands frequently follow the directions of the wind, with eddies under the lee of the islands and the projecting points. Tidal currents of about 1 knot at strength, set through the passages between the islands. Referred to San Diego tides, the strength of the northward current occurs about 1½ hours before high water and the strength of the southward current about 1½ hours before low water. In northwesterly weather a current sets eastward from Cardwell Point toward Talcott Shoal and is frequently felt near and eastward of it.

The prevailing winds around the Santa Barbara Islands are westerly, and the northwesterly winds during the spring months are frequently quite strong. During the winter months there are occasional southeasterly storms which sometimes last for several days, preventing small boats from leaving the protection of the islands. Occasionally, during the fall and winter months, strong northeasterly winds, sometimes reaching gale force, occur. These "northeasters" come up very quickly, usually on a high barometer and a clear sky, and are preceded by several hours of extremely dry, warm air. They blow with a greater velocity in the vicinity of Santa Cruz and Anacapa Islands than around San Miguel and Santa Rosa Islands. These "northeasters" last from a few hours to 3 days. See "Santa Ana," page 66.

SANTA CRUZ CHANNEL

(CHART 5115)

Santa Cruz Channel, between Santa Cruz and Santa Rosa Islands, is about 8 miles long and 5 miles wide, with good water close-in to both islands. The rocks off the western and southwestern points of Santa Cruz Island and the eastern and northeastern points of Santa Rosa Island are so close inshore that they cannot be considered as dangers in the channel.

ANACAPA PASSAGE

(CHART 5114)

Anacapa Passage, between Anacapa and Santa Cruz Islands, is about 4 miles wide and free from dangers; it is steep-to on the Anacapa Island side, and has a gradual slope up to the shore of Santa Cruz Island. Anacapa Passage is seldom used. The passage should not be attempted in thick weather, as the lead gives no warning of a close approach to the islands. Tide rips are strong under certain conditions of wind and current. In the passage, the current is northerly from about 3 hours before high water to 3 hours after high water, and southerly from 3 hours before low water to 3 hours after low water. Currents of 2 knots are experienced in this passage.

THE SANTA BARBARA ISLANDS

(CHART 5202)

Anacapa, Santa Cruz, Santa Rosa, and San Miguel, form a chain about 55 miles long, extending in a general westerly direction from the eastern point of Anacapa Island. They form the southern boundary of the Santa Barbara Channel.

SAN MIGUEL ISLAND

(CHART 5116)

San Miguel Island is the westernmost of the Santa Barbara Islands, and is the most dangerous to approach. Its western point lies a little over 25 miles southward of Point Conception Light, and its eastern point is about 2.7 miles westward of Santa Rosa Island. The passage separating them is San Miguel Passage, described on page 80. The island is irregular in shape and about 7.7 miles long in an easterly direction, with an average width of about 2 miles; the highest points 830 and 822 feet, are near the middle of the island and are visible about 35 miles. The island is covered with grass, but there are no trees. The western part of San Miguel Island has more sand dunes upon it than any of the other islands in the group. The shores are bold, broken, and rocky, with a few short stretches of beach, the southern shore being more precipitous than the northern. Several anchorages and boat landings may be made at different points on the northern and southern shores.

Cardwell Point, the eastern extremity of the island, terminates in a low sandy point extending about 0.5 mile eastward of a cliff about 40 feet high. A dangerous reef extends 0.5 mile eastward of the point, and foul ground extends 0.8 mile north-northwestward. A sunken rock and a rock awash lie about 400 yards southward of the middle of the sandy point. During prevailing weather there are breakers off this point caused by the meeting of the seas.

Prince Island, 288 feet high, lies 2.6 miles northwestward of Cardwell Point, and 0.4 mile off the eastern head of Cuyler Harbor. It is dark in color and rocky, with a precipitous seaward face.

Cuyler Harbor is a bight about 1.2 miles by 0.6 mile in extent, situated on the northern shore southwestward of Prince Island. The anchorage is in the western part of the harbor; the eastern part is foul. It affords good shelter in southerly weather, but the holding ground is poor. In strong northwesterly weather, the heavy swells sweep around the northern shore and into the harbor making the anchorage dangerous. The harbor is not safe in northerly or easterly winds; these winds, however, are rare. Water may be obtained at a small spring abreast the anchorage. Prince Island and Harris Point are prominent in the approaches.

Middle Rock, awash at ¾ tide, lies about 0.5 mile 241° from the western point of Prince Island; foul ground surrounds it for about 100 yards. **Can Rock,** which bares 4 feet at MHW, lies 0.3 mile 214° from the western point of Prince Island; there is foul ground between it and the southern shore of the harbor. Kelp grows profusely all over the bight.

To enter, bring Harris Point to bear 261°, distant 1.7 miles, and the western point of Prince Island to bear 186°, distant 1.3 miles; thence steer **209°,** heading midway between Middle Rock and the western point at the entrance, and when the southern point of Prince Island bears midway between Middle and Can Rocks, anchor in 7 to 8 fathoms. The course heads for **Judge Rock,** small and black, near the western end of the sand beach. The western point at the entrance, **Bat Rock,** should be given a berth of not less than 0.25 mile to avoid the shoal extending eastward for over 300 yards. If desired, anchorage may be made about 0.1 mile farther westward, where better protection is afforded in northwesterly weather. The passage between Prince Island and the eastern head should not be attempted, except by small craft.

Harris Point, the northern point of the island, is bold and precipitous, rising to a hill 485 feet high, 1 mile southward of the point. There are no outlying dangers and the water is bold close-to.

Wilson Rock, 19 feet high, black, lies 2.2 miles 321° from Harris Point. A reef, showing two points at low water, extends about 1 mile 292° from the rock, with foul ground a short distance northward of the reef. It breaks in any light swell from the northwestward. There is foul ground southward and southwestward of the rock. The sunken rock 0.3 mile southward of Wilson Rock forms a breaker. These dangers are unmarked by kelp, and this locality should not be approached in thick weather, as the dangers rise abruptly from deep water, and soundings give no positive warning of their proximity.

Simonton Cove, on the northwestern side of Harris Point is a very shallow bight about 2.4 miles long and 0.6 mile wide. This cove has considerable kelp and a few sunken rocks. There are several fresh water springs in the bluffs just above high water.

From the southwestern head of Simonton Cove, foul ground extends northwestward for nearly 1 mile.

Castle Rock, 172 feet high, is a three-headed islet lying 1.6 miles 26° from Point Bennett in the middle of the kelp field and 0.5 mile offshore. A shoal spot lies 0.5 mile westward of the rock near the edge of the kelp.

Westcott Shoal, with 4¾ fathoms over it, lies about 0.8 mile 25° from Castle Rock, and 0.55 mile 337° from the shoal is a 2¾-fathom spot, near which is an oil spring.

Point Bennett*, the western point of the island, is a long, narrow, jagged bluff, 74 feet high, rising rapidly to 347 feet. High sand dunes extend inland from the point for 2 miles. There are three rocky islets south of and close under the point, and foul ground extends about 0.75 mile westward and northward of the point, but inside the limit of the kelp.

Point Bennett lighted whistle buoy is moored about 0.8 mile southwestward of the point in 17 fathoms.

Caution.—Navigation in this area should not be attempted without local information.

Richardson Rock, 53 feet high, white topped, and of small extent, lies 5.5 miles 321° from Point Bennett. Two smaller and lower rocks lie close-to on the eastern side. The rock rises abruptly from deep water, 30 to 40 fathoms being found within 0.3 mile. The rock is prominent in clear weather, but in thick weather the locality should be avoided, as the lead gives no warning of a near approach. Richardson Rock lighted whistle buoy lies 0.55 mile northwestward of the rock.

Anchorage for small craft may be had at **Adams Cove,** immediately eastward of Point Bennett, and at several places along the southern shore, but local knowledge is necessary.

Tyler Bight, on the southern shore about 1.8 miles eastward of Point Bennett, affords shelter for small craft in northwesterly weather. Anchor in 7 fathoms, sand bottom, at the northwestern part of the bight under the high bluff, with **Judith Rock,** at the western entrance of the bight, bearing 265°, 500 yards distant. A large field of kelp lies southward and eastward. In moderate northwesterly weather, the winds ½ mile offshore may attain velocities up to 50 miles an hour, blowing directly offshore; the sea in the bight, however, is quite smooth.

Wyckoff Ledge, with 9 feet over it, lies about 1.4 miles 280° from Crook Point and 0.5 mile offshore.

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*Lat. 34°02′.0, Long. 120°27′.0: Charts 5202, 5116.

A boat landing may be made on the southern shore of the island in a small cove immediately westward of Crook Point, but there is no anchorage.

Crook Point, the southern point of the island, is low and irregular.

SANTA ROSA ISLAND

(CHARTS 5116, 5115)

Santa Rosa Island lies about 5 miles westward of Santa Cruz Island. The two islands are separated by Santa Cruz Channel, described on page 81. The island is about 15 miles long in an easterly direction, with a greatest width of nearly 10 miles. The highest point, near the middle of the island, is 1,561 feet high and is visible over 40 miles. Water is plentiful, and the island is partially covered with vegetation, but there are no large trees. The shores are bold, high, and rocky, and kelp surrounds the greater part of the island. The depths, in approaching, shoal more abruptly from southward than from northward, where the 100-fathom curve is over 5 miles and the 20-fathom curve about 2 miles from the beach.

There are no harbors, but anchorage may be made in Bechers Bay and Johnsons Lee; there are several good boat landings.

SANTA ROSA ISLAND, WESTERN PART

(CHART 5116)

Brockway Point is high, bold, and rounding, and situated about midway of the northern shore of the island.

Rodes Reef, marked by kelp, is a patch of three sunken rocks lying 1.2 miles 73° from Brockway Point, and about 0.8 mile offshore. It breaks in nearly all weather.

Sandy Point, the western extremity of the island, is moderately bold and rocky, with a detached rock lying close inshore, and sand dunes 400 feet high extending inland. These white sand dunes are prominent when approaching from southward or westward. Shallow water extends off the point. During the general northwesterly weather, swells form at a considerable distance from the shore. The swell also reaches the point from a southwesterly direction.

Sandy Point Anchorage, on the southern side of the point, affords shelter to small vessels of 20 to 30 tons, from northerly and northwesterly winds, but local knowledge is necessary to avoid outlying rocks.

San Miguel Passage, separating Santa Rosa and San Miguel Islands, is described on page 80.

Talcott Shoal, with 1¾ fathoms over it, lies on the edge of the kelp, about 1.5 miles 26° from Sandy Point. The soundings in the vicinity of the shoal range from 4½ to 12 fathoms. The shoal breaks only in heavy weather. In calm weather there is very little indication of the shoal as the kelp is light and there is very little lumping of the water. A detached kelp patch lies 1 mile northward of the shoal.

Bee Rock lies 0.8 mile off the southern shore of the island, about 3.6 miles southeastward of Sandy Point. It is 5 feet above MHW, not easily seen and is surrounded by kelp which stretches from South Point to Sandy Point. A smaller rock, 10 feet above MHW, is about 100 yards southeastward of Bee Rock. A rock, with 2 fathoms over it, lies 650 yards 298° from Bee Rock. In average weather there is a lumping of the water with an occasional break at this point. Several other rocks and shoals exist inside the kelp, which should not be entered.

SANTA ROSA ISLAND, EASTERN PART

(CHART 5115)

South Point, the southern point of the island, terminates in a rocky bluff, 100 feet high, and rises rapidly to a height of 460 feet. Cliffs, several hundred feet high and about ½ mile in extent, comprise the southwestern face of the point. It is marked by **South Point Light** shown from a small white house; the light is 530 feet above water and is visible 19 miles. The light is obscured from 270° to 115°.

Johnsons Lee is an open roadstead immediately eastward of South Point. It affords fair shelter from westerly and northwesterly winds but is dangerous in southerly weather. The anchorage is in the kelp in 5 to 9 fathoms, sandy bottom. No dangers have been discovered in the kelp. The bottom west of **Slay Rock** about 0.75 mile, 36° from the eastern end of South Point, is rocky and dangerous to ground tackle. The Coast Guard maintains a boat landing along a vertical-faced rock, from which supplies are landed for South Point Light.

East Point, the eastern extremity of the island, is moderately high, sharp, and bold. A rock, with 2¾ fathoms over it, lies in the kelp 0.65 mile 16° from East Point and a shoal with 3½ fathoms over it, lies about 2 miles northward of the point.

Skunk Point*, about 2.5 miles northward of East Point, is a low sandy point; it is formed by drifting sand, with sand beaches westward and southward; the sand dunes behind it are 250 feet high. Care should be taken so that the sand spit off Skunk Point is avoided. The current is heavy and Skunk Point is difficult to see on dark nights. In bad weather the sea breaks heavily on the spit.

Bechers Bay is a broad, semicircular bight on the northeastern shore of the island, and is about 4.5 miles long by 1.5 miles wide, lying between Skunk and Carrington Points. **Northwest Anchorage** is in the western part of the bight about 1.5 miles from Carrington Point; it affords fair shelter in northwesterly weather. A wharf has been built with 16 feet at its outer end. The best anchorage is in 6 to 7 fathoms off the end of the wharf. **Southeast Anchorage** is about 1.3 miles westward of Skunk Point, and affords protection in southeasterly weather in about 6 fathoms, sandy bottom.

Carrington Point, the northern point of the island, has a seaward face 0.8 mile in length. It is bold and rocky, and rises rapidly to an elevation of 440 feet.

Foul ground extends about 0.35 mile northward of Carrington Point, terminating in **Beacon Reef,** with a least depth of 2¼ fathoms. The reef rarely breaks and there is no safe passage inside of it.

SANTA CRUZ ISLAND

(CHARTS 5115, 5114)

Santa Cruz Island is the largest of the Santa Barbara Islands. Its western point lies about 21.5 miles 207° from Santa Barbara Light. Its eastern end, San Pedro Point, is 4 miles westward of the western end of Anacapa Island. It is about 21 miles long in an easterly direction, with an average width of about 5 miles. The highest peak, in the western part of the island is 2,434 feet high, and in the eastern part the land attains an elevation of 1,770 feet. The eastern part is very irregular, barren, and destitute water; the western part has a few trees, is well covered with grass, and has several springs. Sheep and cattle are raised to a considerable extent. The shores are high, steep, and rugged, with deep water close inshore and there is much less kelp than around the other islands. There are no outlying dangers except Gull Island.

*Lat. 33°59′.0, Long. 119°58′.8: Charts 5202, 5101, 5101A, 5115.

SANTA CRUZ ISLAND, WESTERN PART

(CHART 5115)

Pelican Bay, a small indentation about 1 mile west-northwestward of Prisoners Harbor, is used as a yacht anchorage during the summer season. In northwesterly weather, small boats using Pelican Bay anchor close to the cliff which forms the western shore of the bay.

Painted Cave, about 3 miles east of **West Point,** the northwestern extremity of the island, is a large cave into which small boats may be rowed for a considerable distance. The entrance is over 150 feet high. Depths of 2 fathoms or better are found at the inside end of the first chamber, 600 feet in. There are several little coves on the north shore, but these are only available to small craft.

Forney Cove, about 1 mile eastward of **Fraser Point** at the western end of the island, affords shelter in northerly weather in 7 to 8 fathoms. The surf is heavy on the beach, but the rocky islet westward, and the reef connecting it with the shore, lessen the swell at the anchorage.

Gull Island, 65 feet high, is the largest and outermost of a group of small rocky islets; it is about 0.2 mile in extent, lying nearly 0.7 mile southward of **Punta Arena,** the southernmost point of Santa Cruz Island. A field of kelp stretches offshore from the southwestern point of the island and terminates about 1 mile eastward of the island. The bottom in the vicinity of these islets is foul. **Gull Island Light*,** 73 feet above the water and visible 11 miles, is shown from a white structure; the light is obscured from 126½° to 264½°.

Willows Anchorage, on the southern shore, about 3.6 miles eastward of Gull Island, is available for small craft in northwesterly weather and affords a good boat landing.

SANTA CRUZ ISLAND, EASTERN PART

(CHART 5114)

Smugglers Cove, immediately southward of the eastern point of the island, affords shelter in northwesterly weather in 5 fathoms, sandy bottom. Water may be obtained from wells on shore.

San Pedro Point is the eastern extremity of the island. **Scorpion Anchorage,** a shallow bight, lies northwestward of San Pedro Point. There is a small boat landing which consists of a cribbed-up landing with a float and gangway at the end of the roadway. There are several large buildings, one of which is white, along the roadway. Large clumps of trees are situated near the houses.

Chinese Harbor, in the eastern part of the broad bight on the northern shore, about 4.5 miles from the eastern point of the island, affords anchorage in the kelp in 5 to 6 fathoms. The northeastern part of the harbor is an excellent anchorage in southeasterly to southwesterly weather in 9 to 10 fathoms. Fresh water may be obtained about 0.8 mile eastward of the anchorage. This harbor affords the best shelter on the island from northeasterly winds.

Prisoners Harbor, in the western part of the bight on the northern shore, about 8 miles from the eastern point, affords shelter from all winds except from northeastward to westward. Some protection in northwesterly weather is afforded by the kelp but a heavy swell rolls in. In northeasterly weather the anchorage is unprotected and dangerous. A wharf, with 16 feet at its face, is located here; a large white house with a tile

*Lat. 33°56′.9, Long. 119°49′.5: Charts 5202, 5101, 5101A, 5115.

roof and other buildings stand back of this wharf. The best anchorage is in 12 to 15 fathoms, sandy bottom, abreast a white rock on the western shore of the bight, with the outer end of the wharf and the buildings at the inner end in range. Fresh water can be obtained.

ANACAPA ISLAND

(CHART 5114)

Anacapa Island is the easternmost of the Santa Barbara Islands, and actually consists of three islands separated by two very narrow openings which cannot be used as passages; the eastern one is filled with rocks bare at all stages of the tide; the western one is only 50 feet wide and is blocked by sand awash at high tide. The eastern point of the island lies about 11 miles southwestward of Point Hueneme, and is marked by **Anacapa Island Light***. The light on a white cylindrical tower, is 277 feet above high water, and is visible 23 miles. The fog signal, situated on a lower white square tower to the eastward and close by the light, is sounded on an air diaphone. A radiobeacon, equipped for distance finding, is operated at the light; there are 3 radio masts.

From the eastern point, the island extends about 4.5 miles in a general westerly direction. The eastern and lowest island of the Anacapa group is about 1 mile long, 0.2 mile wide, 225 feet high, and rather level on top. The middle one is about 1.5 miles long, 0.25 mile wide, and 275 feet high. The western and largest island is about 2 miles long, 0.6 mile wide, and rises to a peak 930 feet high. The westernmost island is visible at a distance of 35 miles in clear weather, and the other two at 15 to 20 miles. The shores of Anacapa Island are perpendicular and filled with numerous caves. The eastern extremity terminates in **Arch Rock,** 80 feet high, with a 50-foot arch and a pyramidal rock just southward of its eastern end. The island is surrounded by kelp except in a few small places.

The lighthouse keepers and 1 or 2 fishermen are the only inhabitants. Seals and pelicans are present in large numbers. There is a group of 8 or 9 houses, cream-colored, with tile roofs, belonging to the radio station, 300 to 400 yards westward of the light. A single large white building stands 100 yards farther to the westward of the group of houses.

There is a group of 4 or 5 weather-beaten shacks on the easternmost island about 100 yards from the pass which separates it from the middle island. They are visible only from the northward.

The best anchorage in southeasterly storms is on the northern side about 0.25 mile northward of the center of the middle island, in 9 to 12 fathoms with the eastern opening of the island open. In northwesterly weather the best anchorage is 0.25 mile southward of the eastern passage in 8 to 12 fathoms. However, it is best for larger vessels to lie at Smugglers Cove, on the eastern side of Santa Cruz Island where the bottom is not so steep-to. Small boats anchor in 5 to 7 fathoms in **East Fish Camp,** a bight about 0.4 mile southwestward of the eastern passage. About the only protection from "northeasters" is to anchor as close to shore as possible, in the bight immediately westward of **Cat Rock,** on the southern side of the western island. The Coast Guard maintains a boat landing and hoist on the northern side near the eastern extremity. Landings can also be made on either side of the island near the western opening, and at East Fish Camp. The island rises abruptly from deep water, and in thick weather in its vicinity, vessels should not shoal the depths to less than 50 fathoms.

*Lat. 34°01′.0, Long. 119°21′.5: Charts 5202, 5101, 5101A, 5002, 5020.

Anacapa Passage, separating Anacapa Island from Santa Cruz Island, is described on page 81.

POINT DUME TO POINT MUGU

(CHART 5202)

Between Point Dume, described on page 71, and Point Mugu, about 14 miles, the coast is very rugged and there are no outlying dangers.

About 2 miles eastward of Point Mugu, on the beach at the foot of a very high bluff is a sand dune, 140 feet high. This is quite prominent and can be made out on clear, moonlight nights.

Point Mugu is the seaward termination of the Santa Monica Mountains, and is prominent on account of the lowland of the Santa Clara Valley to the westward. The cuts and fills of the highway which skirt the shoreline from Point Mugu eastward are prominent. Mugu Canyon is described on page 71.

POINT MUGU TO VENTURA

(CHART 5007)

Mugu Lagoon, immediately westward of Point Mugu and parallel with the beach, is about 4 miles long at high water. The mouth of the lagoon shifts along the beach from year to year, and although local fishing boats drawing 4 to 5 feet have entered the lagoon at high tide and a smooth sea, it must not be attempted without local knowledge. A small pleasure pier and a few cottages are located just westward of the lagoon entrance. Small boats can anchor about 200 yards east-southeastward of the offshore end of the pier. The 100-fathom curve of a submarine valley lies about 1.2 miles off the lagoon.

Laguna Point and **Middle Point** are merely wider portions of the sand beach separating Mugu Lagoon from the sea. They are not prominent from seaward.

Point Hueneme, low, rounding, and sandy, about 8 miles northwestward of Point Mugu, is the outermost point of the low land at the mouth of the Santa Clara Valley.

Point Hueneme Light* is prominent. The light shown from a white square tower on the fog signal building is 52 feet above high water and is visible 13 miles. The fog signal is an air diaphone.

There is a radio direction finder station at Point Hueneme.

Hueneme Canyon is a submarine valley extending in a southerly direction from Point Hueneme.

Port Hueneme is an inland basin protected by two jetties at the entrance. The western jetty extends 275 yards in a southerly direction, and has a light at its outer end. The eastern jetty extends 100 yards southerly, thence 225 yards southwesterly. A buoy is moored about 200 yards south-southeastward of the end of the eastern jetty. The former lighthouse of Point Hueneme has been moved to the western side of the entrance channel about 0.35 mile from the entrance, and is used as a yacht clubhouse. The entrance channel has been dredged 32 feet in July 1940. In 1942, the controlling depth on the range was 32 feet. † In_____ 19____, the controlling depth in the channel was: _____

_____

*Lat. 34° 08′.8, Long. 119° 12′.5: Charts 5202, 5007, 5002, 5020, 9000.

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

Port Hueneme lighted range is located on the axis of this channel bearing 37°. The front day-mark is a black triangle, vertex up, with a white stripe on a pole. The rear daymark is a black triangle, vertex down, with a vertical stripe on a pole. The lights are visible only on the range.

The central basin, about 900 by 1,200 feet, has a depth of 30 feet. In 1942, the depth in the basin was 30 feet with a 28-foot shoal located 455 yards 176° from Port Hueneme Range Front Light. A boat basin of 15 feet is at the northern end of the central basin. There is a bulkhead wharf on the southern side of the central basin. A transit shed and railroad tracks are on this wharf.

Pilots are required for all vessels over 300 gross registered tons unless under the control of a master holding a federal pilot's license for Port Hueneme. The pilots are employed by the Harbor Commissioners of the Oxnard Harbor District. Los Angeles is the port of entry.

All harbor offices are located at the transit shed on the wharf, where complete regulations and tariffs may be obtained.

Oxnard, about 3.5 miles northward of Hueneme and inland, is the nearest town of any size, and communication may be had by rail, motor truck, and bus. Sugar beets and lima beans are grown extensively.

A row of cottages extends northwestward along the beach for 2 miles from Point Hueneme.

From Point Hueneme the coast, consisting of low sand beaches and sand dunes, trends northwestward for 9 miles to the mouth of the **Ventura River.**

Ventura lies about 8.5 miles northwestward of Point Hueneme. There is a wharf, with moorings provided, 2,010 feet long, with a depth of 19 feet at the outer end, and 18 feet at the inner end of the 250-foot loading face. The outer end of the wharf is marked by a light 25 feet above the water. Fresh water and fuel oil are piped to the wharf. The prevailing winds are westerly and gales are rare.

Small pleasure and fishing boats anchor eastward of the wharf during the summer months, but it is not a safe anchorage in winter and spring on account of southwesterly swells and comparatively shallow water. Vessels anchor anywhere in the bight with good holding ground, but there is no protection. The buildings in the town, the oil tanks at the inner end of the wharf, and the railroad trestle crossing Ventura River immediately west of the town, are prominent features in approaching. **Padre Serra's Cross,** on a 350-foot hill immediately northwestward of the center of the town is neon-lighted and a good mark at night. There are several aluminum-colored tanks and many oil derricks high up the slopes of the hills northwestward of the town.

There are two submarine pipelines leading to floats eastward of the wharf, which are used for loading gasoline and fuel oil.

One mile southeastward of the wharf are the ruins of a small pleasure pier at **Pierpont Bay,** a beach resort.

A lighted bell buoy is moored in 60 feet about 1 mile 227° from the outer end of the wharf.

Communication may be had by the main line of the Southern Pacific Railroad, north and south, by bus, and by telegraph and telephone.

VENTURA TO SANTA BARBARA

(CHART 5202)

From the Ventura River the **Santa Ynez Mountains** extend to Point Conception and Point Arguello. For about 10 miles westward from the river to Rincon Point the coast is very rugged, elevations of over 2,000 feet being found within 1 mile of the beach. The dangers do not extend over 0.5 mile from the beach which is well fringed with kelp. From Ventura to Santa Barbara both the highway and railroad skirt the shore; retaining walls are a common feature.

Point Las Pitas is the first bold point westward of the river. A very steep arroyo or gulch is on its western side. Eastward of Point Las Pitas is a mile of beach cottages. High on the steep slopes, above the cottages, may be seen derricks and tanks of an oil field.

Point Gorda, about 3.5 miles westward of Point Las Pitas, is low at the extremity, but rises rapidly to **Rincon Mountain,** a prominent mountain about 2,170 feet high. Eastward of Point Gorda there is a pier about 2,800 feet long with several oil derricks on it. Tanks and numerous derricks are situated eastward of this pier.

Rincon Point, low and sandy, is about 10 miles westward of Ventura and the same distance eastward of Santa Barbara.

Sand Point, about 3.5 miles westward of Rincon Point, is low and rounding, with the narrow opening to **Carpinteria Lagoon,** shoal and of no importance, lying close under and eastward of it. A rock awash at low tide is located 550 yards offshore from Sand Point.

Carpinteria is a small town about 9 miles eastward of Santa Barbara. A light-colored club house and short pier on the beach at the eastern side of Carpinteria are prominent. An aluminum water tank may be seen among the buildings of the town. One mile northwestward of Carpinteria, on the highway, is a tall skeleton tower of a hotel which is neon-lighted at night, and is clearly seen from seaward for a distance of 10 miles.

Serena is a small place in the bight just eastward of **Loon Point.**

Summerland is a small town about 4.5 miles eastward of Santa Barbara. There are a number of small wharves, built out to oil derricks situated in the water near the beach. None of the wharves are suitable for landings.

Ortega Hill, about 0.5 mile westward of Summerland and some 250 feet high, is conspicuous because of the extensive cuts for the highway, and from offshore, has the appearance of a large slide.

SANTA BARBARA

(CHART 5261)

Lavigia Hill, 592 feet high, is the distinguishing feature in approaching Santa Barbara from eastward or westward, and can be seen before either the lighthouse or mission. **Point Castillo,** its northeastern extremity, terminates in an almost perpendicular cliff about 50 feet high, while **Santa Barbara Point,** its southeastern extremity, is a high cliff and is the eastern limit of the narrow tableland upon which the light is located.

Santa Barbara Light* shown from a white square pyramidal tower, is 142 feet above water and visible 18 miles. The light is obscured in the northern half of the horizon. The lighthouse is situated on the gently rounding point 2 miles southwestward of the Santa Barbara Wharf.

* Lat. 34°23′.8, Long. 119°43′.2: Charts 5202, 5261, 5002, 5020, 9000.

Santa Barbara is situated immediately northeastward of Lavigia Hill. The harbor is the yachting center for this section of the coast. An angular breakwater 750 yards in length extends from Point Castillo. The outer end is marked by a light. Electric lights, at intervals of 32 yards, mark the length of the breakwater. At times these lights are difficult to pick up against the background of lights in the city.

A lighted whistle buoy is moored about 1 mile southward of the light on the end of the breakwater.

St. Anthony's Seminary Spire, the neon-lighted theater spire in the center of the town, the neon-lighted hotel tower on the beach 1 mile eastward of the town, and the many residences on the hillsides in back of the town, are conspicuous.

The spire of St. Anthony's Seminary, and the white square tower of a service station, form a good range for approaching the wharf at Santa Barbara from the southeastward. The bearing of this range is 320°.

At night the electric lights of Santa Barbara are prominent from the channel, but they are obscured from the westward by Lavigia Hill.

There is a **chart agency** of the U. S. Coast and Geodetic Survey situated here.

Stearns Wharf extends 680 yards in a southeasterly direction and there is a light on the outer end. There are depths from 18 feet at the inner end of the eastern loading face to 22 feet at the outer end. Fresh water, gasoline, and diesel oil can be obtained on the wharf, but there are no facilities for taking coal. There are facilities on the wharf for hoisting boats up to 60 feet in length by a 40-ton boat hoist. Engine and hull repairs can be made. Moorings are provided for the use of vessels at the wharf. Few coasting vessels call at Santa Barbara.

The prevailing winds are westerly. Southeasterly gales occur occasionally during the winter months. Good anchorage may be had anywhere inside the kelp, but large vessels anchor outside the kelp on account of better holding ground. The wharf may be approached with safety on any northwesterly course between 290° and 360°. The approach is through a break in a heavy bed of kelp, usually kept clear by passing steamers. The entrance channel lies between the end of the wharf and the lighted buoy 300 yards 223° from it.

Small boats have good anchorage behind the breakwater in depths up to 22 feet, with good holding ground, and are usually moored fore and aft on account of limited room. Mooring space is assigned by the harbormaster who has an office on the breakwater. Boat landings are located on the western side of the harbor at the breakwater, where gasoline and oil are available at a float.

Communication may be had by rail and motor vehicle, and there are complete telegraph and telephone facilities. Marine and general supplies are available.

Storm warnings are displayed by the United States Weather Bureau at the inner end of Stearns Wharf and are plainly visible from the harbor.

SANTA BARBARA TO POINT ARGUELLO

(CHART 5202)

From Santa Barbara westward to Goleta Point the coast consists of bluffs from 30 to 100 feet high with short stretches of sand beach. It is fringed with kelp at distances of from 0.2 to 0.5 mile offshore. There are no dangers, and the 10-fathom curve lies from 0.2 to 0.8 mile offshore.

Goleta Point, 7 miles westward of Santa Barbara Point, is low, and terminates in a cliff about 30 feet high.

From Goleta Point to Point Conception, 32 miles, the coast is more rugged than that eastward. **Gaviota Canyon,** 26 miles westward of Santa Barbara Light is conspicuous, as it is the only decided break in the range of mountains extending to Point Conception. A railroad skirts the shore, with trestles and embankments across the mouths of the numerous gulches and arroyos. The kelp grows quite heavily, and in some places extends over a mile offshore. The Pacific Highway parallels the coast from Santa Barbara to Gaviota, where it turns inland.

Coal Oil Point, 2 miles westward of Goleta Point, is low and may be distinguished by the strong odor of petroleum discharged by a spring. This odor is noticeable over 2 miles offshore. The point is marked by a tall oil derrick about 300 yards offshore.

Ellwood oil field, about 2 miles northwestward of Coal Oil Point, extends for more than 1 mile along the shore and is marked by some 15 wharves with many tall derricks. The longest wharf is more than 2,000 feet long. Several large tanks may be seen on the bluffs above the beach. Large tankers call frequently for oil at the submarine pipeline off the wharves. The moorings are in about 10 fathoms, sandy bottom.

A rock, with 15 feet over it lies about 3.7 miles westward of Coal Oil Point and 0.9 mile offshore; it is surrounded by kelp. This rock is the outermost danger along the north side of the Santa Barbara Channel.

Capitan, about 7.5 miles westward of Coal Oil Point, is situated in a small bight which offers but little protection to small craft. About 1 mile northwestward of Capitan, and 0.3 mile inland, is a lone, aluminum-colored, conspicuous tank on a bare hill, 550 feet high.

Refugio Beach at **Orella,** about 2.5 miles westward of Capitan, is a small auto camp at the mouth of the canyon. There is a small bight here which offers some little protection for small boats in northwesterly winds, in about 15 feet of water.

Alcatraz Landing at **Gaviota,** about 13.5 miles eastward of Point Conception, has a wharf built out to 30 feet to carry oil pipes. There is 23 feet at the inner end of the loading face; there is water on the dock. Five moorings are provided for holding vessels while at the dock. Fuel may be had here in emergencies only, as it is an oil-shipping dock.

About 5.3 miles westward of Alcatraz Landing is a high, lone derrick situated near the shore on top of a 100-foot cliff.

Coxo Anchorage, about 1.5 miles eastward of Point Conception, affords protection off the mouth of the Coxo Valley, from moderate westerly and northwesterly winds, in 5 to 10 fathoms, hard sandy bottom. The cove about 1.75 miles eastward of this anchorage, known as **Little** or **Old Coxo,** is foul and affords but little protection.

Point Conception, at the western end of Santa Barbara Channel, is a bold headland, 220 feet high, and marks an abrupt change in the trend of the coast. There is comparatively low land immediately behind it. At a distance, when coming from northward or eastward, it is usually made as an island. **Point Conception Light,*** near the western part of the point, is shown from a white tower behind a dwelling. The light is 133 feet above the water, and visible 18 miles; the fog signal is sounded on an air diaphone. A low, black rock, nearly awash at high tide, lies 220 yards offshore, southward and westward of the light.

Winds.—Point Conception has been called the **Cape Horn of the Pacific** on account of the heavy northwesterly gales that are encountered off it, on coming through the Santa Barbara Channel. A marked change of climatic and meteorological conditions is

*Lat. 34°26′.9, Long. 120°28′.2: Charts 5202, 5302, 5002, 5020, 9000.

experienced off the point, the transition often being remarkably sudden and well defined. When the northwesterly winds are strong they blow down the various canyons between Point Conception and Capitan, causing heavy offshore gusts.

From Point Conception the coast trends in a gentle curve northwestward for about 12 miles to Point Arguello, and consists of bold, rocky cliffs, 100 to 400 feet high. The coast railway runs along these cliffs and through several tunnels between Point Conception and Point Arguello.

Submarine gorges.—The 100-fathom depth curve off Point Arguello and to a lesser extent off Point Conception is characterized by a succession of indenting deeps or gorges. In following the curve during thick weather with the use of an echo sounding instrument, these submarine characteristics should be found extremely useful in fixing the position of the vessel.

Espada Bluff is a prominent cliff, 360 feet high, about 5.5 miles northward of Point Conception. The cliffs on each side drop sharply to less than 100 feet in height; Espada Bluff is quite prominent from seaward.

A Coast Guard station is situated about 2 miles southeastward of Point Arguello.

Point Arguello is a narrow, jagged, rocky projection, extending about 800 yards westward of the general trend of the coast, with an outlying rock lying about 200 yards seaward. The extremity of the point overhangs the water's edge and about 200 yards inshore, the point is nearly divided by gullies on the northern and southern sides. These form a saddle, which, from northward and southward, appear as two small heads. The western extremity of the point is marked by **Point Arguello Light,** on a white skeleton steel tower. The light is 124 feet above the water, and visible 17 miles. The fog signal is sounded on an air diaphone. The radiobeacon at the light is equipped for distance finding.

Tranquillon Mountain, near the seaward end of the Santa Ynez Mountains, is prominent in clear weather. It terminates in Rocky Point, Point Arguello, and Point Perdernales, which are separated by a little over a mile.

Rocky Point has numerous detached rocks, extending in some cases 300 yards offshore.

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Chapter 6.—POINT ARGUELLO TO POINT SUR

(CHART 5302)

POINT ARGUELLO TO SAN LUIS OBISPO BAY

(CHART 5302)

From Point Arguello to Point Sal the coast trends northward for about 19.5 miles in two shallow bights, separated by Purisima Point, about 10.6 miles northward of Point Arguello. From Point Sal the coast continues northward for about 14 miles, then bends sharply westward for a little over 6 miles to Point San Luis, forming San Luis Obispo Bay. The lead is a good guide on this stretch of the coast; between Point Arguello and Point San Luis the 20-fathom curve can be followed with safety in thick weather. In clear weather, the headlands and other natural features can be easily recognized.

Point Pedernales and the largest of the numerous detached rocks, extending in some cases 300 yards offshore, are very dark and conspicuous, as sand dunes commence immediately northward of the point. A lighted whistle buoy is moored off this point.

The **Canada Honda,** about 2 miles northward of Point Arguello, is a deep gulch crossed by a railroad trestle easily distinguished when abreast the mouth.

From Canada Honda the coast to Purisima Point consists of a low tableland and sand dunes that contrast strongly with the dark cliffs southward.

Purisima Point is low and rocky, with reefs extending southwestward for 0.3 mile. The northern side of the point is bare sand. It has been reported that an inshore set is experienced off the coast in the vicinity of Purisima Point.

From Purisima Point to Point Sal the coast is sandy and lower than that southward.

Port Petrol, an oil loading plant, is situated about 5.8 miles northward of Purisima Point. The end of the submarine pipeline and the mooring site are approximately 3,300 feet offshore. About 200 yards back from the beach there are a small pumping plant and some small structures. A little farther up on the slope are two aluminum-colored oil tanks, which should make useful landmarks in approaching the port.

Point Sal* is a bold, dark headland marked by stretches of yellow sandstone. From northwestward, the headland appears as a low, conical hill, with two higher conical hills immediately behind it; it rises gradually to a ridge 1,637 feet high, in 3 miles to the eastward; from southward, the hills are not so well defined. **Seal Rock,** 54 feet high, a large rocky islet, lies 200 yards off the south face with a small rock close to the point. Breakers and reefs extend nearly 600 yards southward and westward from Point Sal and 200 yards southwestward of Seal Rock.

Anchorage may be had under Point Sal with some protection from northwesterly winds, in 7 to 9 fathoms, sandy bottom, but subject to swell. Shoal water extends nearly 0.5 mile westward from the southeastern point of the anchorage. The best anchorage is in 7 fathoms with the northern end of Seal Rock just open of the extremity of Point Sal, bearing 303°, distant 500 yards from Seal Rock.

*Lat. 34° 54′.1, Long. 120° 40′.3: Charts 5302, 5002, 5020.

From Point Sal northward the coast consists of sand beach backed by low sand dunes for 14 miles, and then changes to bold, rocky cliffs that curve sharply westward to Point San Luis and form the northern shore of San Luis Obispo Bay.

Oceano is a small summer resort about 12 miles northward of Point Sal. There is a small hotel on the beach.

Pismo Beach is a resort town 6 miles eastward of Point San Luis. There is a substantial wharf here, built out to 27 feet. At present there is no shipping, the wharf being used for fishing and pleasure purposes only. Pismo Beach is noted for its clams.

SAN LUIS OBISPO BAY AND PORT SAN LUIS

(CHART 5386)

San Luis Obispo Bay is a broad open bight immediately eastward of Point San Luis, about 3.6 miles long in an easterly direction, and about a mile wide. The western shore is high with rocky bluffs extending for 1.5 miles to the mouth of San Luis Obispo Creek, where there is a sand beach about 0.5 mile long to the town of Avila; thence eastward for 1 mile are irregular cliffs, 40 to 100 feet high. Beyond these for about 1.5 miles is a narrow tableland, terminating in cliffs about 40 feet high to the eastern point of the bay. The bay has been examined by means of the wire drag, and the dangers are shown on the chart.

The bay has been improved by the Government. A breakwater has been built from Point San Luis to Whaler Island, and from the island about 650 yards southeastward to the ledge which partly bares at low water. This has improved the shelter for vessels at anchor, or at the wharf, from heavy westerly or southwesterly swells.

Mount Buchon and **San Luis Hill,** the latter 700 feet high, are prominent at a considerable distance in approaching from southward; and from northward, Lion and Pecho Rocks, and Point Buchon, are distinguishing features.

The eastern part of the bay is foul. **Howell Rock,** with 13 feet over it, which lies 1.6 miles 93° from San Luis Obispo Light, is the outermost danger.

Point San Luis, the western point at the entrance to San Luis Obispo Bay, is bold and rocky, and is marked by **San Luis Obispo Light.** The light is shown from a white tower on dwelling and is 130 feet above the water, visible 17 miles. The fog signal is sounded on an air diaphone. There is a low power radio beacon synchronized for distance finding at the light.

Souza Rock, with 16 feet over it, lies a little over 2 miles 148° from San Luis Obispo Light. It rises abruptly from depths of 114 feet. A lighted gong buoy is moored about 200 yards southward of the rock.

Whaler Island, 72 feet high, lies 125 yards eastward of the point, to which it is connected by a jetty. Avila breakwater extends 600 yards east-southeastward of the island. A lighted whistle buoy is moored about 500 yards 150° from the end of the breakwater.

Smith Island, 44 feet high, lies 400 yards northward of Whaler Island and 150 yards offshore. There are several small fishermen's houses on the island.

Port San Luis, the principal seaport for San Luis Obispo, situated about 12 miles inland and connected with it by a narrow-gage railway, is about 0.7 mile northward of Point San Luis in the most sheltered part of the bay. This railroad has been authorized to abandon service. A wharf, known as the **Port San Luis Wharf,** nearly

0.4 mile long, is built out southeastward; a large warehouse is situated about 200 yards from the outer end. Near the gulch, about 0.2 mile from the shore end of the wharf, are a few small houses. The berthing space, with a depth of 20 feet alongside, is opposite the warehouse. Trucks can operate over the wharf; the outer portion is used for car storage only.

To reach the wharf, deep-craft vessels pass 300 yards southeastward of the lighted whistle buoy, then steer for the east stack at Avila (which may be difficult to see), course **029°,** until the end of the wharf is abeam; then steer for the end of the wharf, course **299°.**

Pier No. 2 known as the "middle dock", is built out 3,150 feet from the point near the western entrance of **San Luis Obispo Creek,** and has a depth of 30 feet at low water at its outer end. About 200 yards inside its outer end, the wharf crosses a rocky patch having 17 feet over it, and care should be exercised in that vicinity. A light and a fog signal are privately maintained on the outer end of the wharf for use only when ships are expected. The wharf is lighted throughout its length when ships are being loaded. It is not safe for ships to moor alongside in strong northerly weather, and they usually leave the pier on the approach of such weather, and anchor until the weather moderates. The oil tankers, which are the only deep-draft vessels entering the bay, use this wharf.

Avila, about 1.5 miles northeastward of Point San Luis, is a small settlement of no commercial importance. **County Wharf** has been built to a depth of 25 feet, but it is in poor condition and is not used commercially. It is used to some extent as a landing for fishing and pleasure boats and is lighted all night.

Anchorage.—The best anchorage for small vessels is in 21 to 24 feet, muddy bottom, midway between the end of the Port San Luis Wharf and Smith Island. Large vessels can anchor anywhere between the Port San Luis Wharf and Pier No. 2, avoiding the 18-foot spot 250 yards eastward of the warehouse near the middle of the former. This anchorage affords good shelter in northerly or westerly weather, but is exposed in southerly or southeasterly weather when heavy swells make anchorage poor. Southeasterly gales occur two or three times during the winter season.

Customs.—Port San Luis is a subport of the San Francisco customs district, and a deputy collector of customs is stationed at Avila.

Commerce.—The port is used solely for the shipment of oil and a few commodities produced locally, and for the receipt of supplies required for local consumption. The shipments of petroleum products amount to about 99 percent of the total traffic.

Supplies.—Fuel oil, water, and some provisions can be obtained. Coal is not kept on hand but can be supplied.

Communication is by irregular coasting steamers and by bus. There are telephone and telegraph facilities.

Port Series.—For detailed information concerning port conditions, facilities, regulations, rates, commerce, and communications consult Port Series No. 13, Part 2, prepared by the Corps of Engineers, United States Army.

DIRECTIONS, SAN LUIS OBISPO BAY

These directions are available for vessels of any draft and lead to the anchorage.

From southward.—From a position 2.8 miles 230° from Point Arguello Light (Position 5 of table 1 on page 42), steer **356°** for 34 miles (Chart 5302). This course made good should lead to the lighted gong buoy southward of Souza Rock. Pass 100 yards westward of the bell buoy and head for the middle dock, course **000°,** for 2 miles, until

the end of the Port San Luis Wharf bears 295°; then haul to **321°** passing about midway between the ends of the two wharves, and select anchorage according to draft.

From northward.—From a position with San Luis Obispo Light* bearing 52°, distant 3.5 miles, which position may be reached in thick weather by following the 30-fathom curve to the fog signal abeam, steer **065°** for 4.1 miles, passing 175 yards southeastward of Point San Luis lighted whistle buoy, and to a position with the middle dock bearing **000°.** Then proceed as directed in the preceding paragraph.

SAN LUIS OBISPO BAY TO ESTERO BAY

(CHART 5386)

From Point San Luis to Point Buchon the coast trends northwestward for about 9 miles and consists of cliffs, 40 to 60 feet high, with numerous outlying rocks. The land rises rapidly from the cliffs to Mount Buchon. There are numerous outlying rocks and sunken ledges, in some cases, extending over a mile from the shore.

A rock, with 46 feet over it, lies 1.3 miles 197° from San Luis Obispo Light.

Westdahl Rock, with 18 feet over it, is a dangerous pinnacle rock lying a little over 1.3 miles 235° from San Luis Obispo Light. It rises abruptly from depths of 60 feet. A lighted bell buoy is moored about 245 yards southwestward of the rock. Vessels should not pass northward of the buoy.

Santa Rosa Reef, with a least depth of 17 feet, lies 1.4 miles 258° from San Luis Obispo Light. This reef rises abruptly from depths of 60 feet.

Lone Black Rock, 2 feet high and of small extent, lies about 0.5 mile westward from the light, and 0.2 mile offshore.

Pecho Rock, 31 feet high, lies about 3 miles 292° from the light and 0.55 mile offshore. A smaller rock lies nearly on the same bearing 0.3 mile eastward from it. Foul ground, marked by kelp, lies between the rocks and the shore.

ESTERO BAY

(CHART 5387)

There is a sharp, prominent, dark gray rock, 111 feet high, about 2.9 miles northwestward of Pecho Rock.

Lion Rock lies 2.65 miles southeastward of Point Buchon and 600 yards offshore. It is 240 yards long in a northwesterly direction, and 136 feet high. A high rock lies between it and the shore, and a small low rock lies 200 yards westward.

Point Buchon terminates in an overhanging cliff, 40 feet high, with a low tableland behind it, which rises rapidly to a bare hill, 1,280 feet high, about 1 mile eastward of the point. There are a few detached rocks close under the cliffs. The point is marked by Point Buchon lighted whistle buoy placed 1 mile southward of the western extremity of the point.

Mount Buchon is a rugged mountain mass lying between San Luis Obispo Bay, Estero Bay, and the valley of San Luis Obispo. It is a prominent landmark from either northward or southward. **Saddle Peak,** 1,833 feet high, is visible over 40 miles.

The coast in Estero Bay follows a general northerly direction, from Point Buchon for a distance of 11 miles and then turns sharply to the westward for 5 miles, to Point

*Lat. 35°09′.6, Long. 120°45′.0°: Charts 5386, 5302, 5020.

Estero. The northern shore of Estero Bay is fringed with numerous sunken rocks and scattered kelp. The seaward faces of Cayucos Point and **Point Estero** consist of cliffs, 50 to 90 feet high.

The shoreline drops abruptly from the bold headland of Mount Buchon to a sandy spit bordering Morro Bay and then rises to a bluff-bordered, treeless country of rolling hills.

Morro Rock, 578 feet high, is a prominent conical rock off the entrance to Morro Bay and is an excellent landmark offshore. **Pillar Rock,** 100 feet high, lies about 50 feet from its northern side. A row of peaks extend inland in a south-southeasterly direction from Morro Rock; **Hollister Peak,** 1,409 feet high, because of its jagged appearance, being the most prominent.

Morro Bay, a shoal lagoon several miles in extent, is separated from Estero Bay by a narrow strip of sand beach. The entrance is along the southern side of Morro Rock, but it is available for small, light-draft craft only in smooth weather. A lighted bell buoy is moored about 1,000 yards southward of Morro Rock. The depths in the channel are variable, and the position shifts, so that a stranger should not attempt an entrance without local knowledge; once inside, there is good protection for launches. There are extensive mud and sand flats inside the bay. One should mind the chart after gaining entrance, especially at high tide. A pilot may be had by making a signal off the town. A breakwater connects Morro Rock* to the northern side of the entrance to Morro Bay. A 5¼-fathom spot, about 1.25 miles northwestward of Morro Rock, is marked by a gong buoy. The town of **Morro Bay** is situated on the eastern shore of the bay near the entrance. Gasoline, water, and provisions may be had. There is a good highway to San Luis Obispo and to Cayucos.

A submarine oil loading terminal is located about 1.5 miles northward of Morro Rock. A bell buoy is moored about 400 yards northwestward of this terminal. Ships loading, lie with their bows in the direction of the prevailing northwesterly wind. Ships should be equipped with not less than five 700-foot lines of good 10- and 12-inch manila or equal for use as breast and stern moorings. Adequate lines for offshore breast moorings are absolutely essential in case of a southerly wind to prevent damage to the vessel and terminal equipment. Each terminal is connected with the shore station by telephone. Printed instructions are issued; a mooring master supervises the mooring of vessels.

Two submarine oil loading terminals are located off **Toro Creek** in 50 feet of water, about 2.5 miles northward of Morro Rock. The submarine pipelines to the respective terminals leave the shore in the form of a V. A gong buoy is moored about 400 yards westward of the northern terminal, and a bell buoy is moored about 500 yards westward of the southern terminal. There is a small boat wharf, marked by a light, near the shore end of the pipelines. The remarks in the foregoing paragraph concerning moorings, mooring lines, mooring master, telephone, and printed instructions, apply also to this terminal.

Cayucos is situated about 11 miles northward of Point Buchon, in the northeastern part of Estero Bay. The landing is no longer used and the wharf is in a dilapidated condition. There is a large general store here, and a limited amount of provisions may be procured. Travel is by bus over a good highway to San Luis Obispo.

Anchorage with fair shelter from the northward and northwestward is obtained

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*Lat. 35°22′.0, Long. 120°52′.0: Charts 5302, 5387.

in 11 fathoms, sandy bottom, with the prominent white concrete tank on a hill westward of Cayucos, bearing 17°.

Mouse Rock, with a least depth of ½ fathom, is a submerged rocky ledge about 800 yards off the village of Cayucos, which breaks heavily in all but smooth weather. It is marked by a bell buoy.

Constantine Rock has a least depth of 1¼ fathoms over it and lies 0.5 mile off **Cayucos Point,** a low rocky promontory about 3 miles eastward of Point Estero. It is marked by a buoy placed about 200 yards southward of the rock, and breaks heavily in a moderate swell.

ESTERO BAY TO SAN SIMEON POINT

(CHART 5302)

From Point Estero northward to the village of Cambria, the bluffs increase in height, and the range of grassy hills lies close to shore. The shoreline is well fringed with kelp, with a number of rocks lying close inshore, of which **White Rock,** about 6 miles northward of Point Estero, is the most prominent.

A submerged pinnacle rock, with a least depth of 5½ fathoms, lies 0.7 mile 224° from White Rock.

Von Helm Rock, with a least depth of 2½ fathoms, lies about 7.5 miles west-northwestward of Point Estero and southeastward of the village of Cambria; it is nearly a mile offshore. The rock is very sharp and only breaks in the roughest weather. A lighted whistle buoy marks the danger and vessels should keep well outside the buoy.

Cambria lies about 1 mile inland, among a grove of pine trees, but a number of streets and buildings are visible from seaward. No landing or anchorage is recommended.

From Cambria to San Simeon the close inshore rocks continue, but the bluffs decrease in height and the hills recede from the shoreline. Thick groves of pine trees scatter the hillsides. Several rocks lie offshore, **Cambria Rock,** 10 feet high, and **Pico Rock,** 12 feet high, being the largest, but they are not prominent from seaward. Shoal patches, distant as much as 360 yards, surround Cambria Rock, and there is foul ground northwestward and southward of Pico Rock. A shoal with a least depth of 3¾ fathoms over it lies 580 yards 249° from Pico Rock.

San Simeon Bay is formed by the shoreline curving sharply to the westward, and on the western side, by **San Simeon Point,** a low wooded projection extending in a southeasterly direction. The trees show well from westward, but from southward, the warehouses and buildings in the village are more prominent. From westward, the point itself is not easily recognized unless familiar with it.

A bell buoy, 0.4 mile southeast of the point, marks the entrance to San Simeon Bay.

The bay offers good shelter in northerly weather but is exposed to the southerly gales occurring in the winter. The best anchorage is in the middle of the bight in 5 to 8 fathoms, hard sand.

San Simeon is a small village with a group of conspicuous white buildings. There is a general store where a few provisions can be obtained; a post office is located in the wharf shed. The wharf extends into 16 feet of water and fresh water has been piped to the head of the dock where it can be taken aboard with a long hose. There are telephone facilities in the village and daily bus service to San Luis Obispo.

An airplane landing field is located about 0.5 mile northeastward of the wharf and is marked by a lighted air beacon. The landing field and the dwellings, with the excep-

tion of the store, are the property of William Randolph Hearst, whose prominent house, a castle-like structure, is situated about 2.75 miles east-northeastward of the village at an elevation of 1,602 feet above the water. Two turrets in the house are kept lighted at night and are visible well out to seaward.

DIRECTIONS, SAN SIMEON BAY

From southward.—From a position 0.5 mile southwestward of Von Helm Rock lighted whistle buoy, steer **334°** for 7 miles with the wharf at San Simeon ahead, which leads to the anchorage. At night enter the bay with the air beacon bearing **000°.**

From northward.—From a position 1.5 miles 232° from Piedras Blancas Light, steer **106°** for 6 miles to a position 0.75 mile south-southeastward of San Simeon Point. Round San Simeon Point at a distance of over 0.5 mile, steer **337°** for the wharf, and anchor in the middle of the bay. At night enter the bay with the air beacon bearing **000°.** At the anchorage, San Simeon Point should be given a berth of over 0.25 mile and the eastern shore of the bay a berth of 0.5 mile.

SAN SIMEON POINT TO PFEIFFER POINT

(CHART 5302)

The coast from San Simeon Point to Point Piedras Blancas, a distance of about 5 miles, is low with numerous detached rocks lying, in some cases, over 0.5 mile offshore and usually well marked by kelp.

Point Piedras Blancas is a low rocky point projecting about 0.5 mile from the general trend of the coast, and is marked at its end by **Piedras Blancas Light*** on a white conical tower. The light is 158 feet above the water and visible 19 miles; a fog signal is sounded on an air diaphone.

Piedras Blancas are two large white rocks, 74 feet and 31 feet high, appearing from the southward as one rock, lying 500 yards offshore and about 0.8 mile eastward of the point.

Outer Islet is a large and prominent white rock, 110 feet high, lying close under the point to the westward. In hazy weather this rock is sometimes visible from the northwestward and southward, when the light cannot be seen.

Anchorage for a small vessel, with protection from northwesterly winds, may be had under Point Piedras Blancas in 4 to 5 fathoms, sandy bottom, with the light bearing 280°, distant about 0.25 mile.

A shoal, with a least depth of 11 fathoms, determined by dragging, lies about 3 miles west-northwestward from Piedras Blancas Light. This has been reported breaking in a heavy westerly swell.

From Point Piedras Blancas to the mouth of the San Carpoforo Valley, about 8.6 miles, the coast is low, with small bluffs and rolling, treeless hills. Numerous outlying rocks, well fringed with kelp, extend well offshore. **Harlech Castle Rock,** the outermost, bares 1 foot at MLLW, and lies 1.5 miles 327° from Piedras Blancas Light, nearly 0.75 mile offshore; it is not usually marked by kelp. A shoal of 2¾ fathoms lies about 0.5 mile northwestward of Harlech Castle Rock. The general depths around this shoal are from 10 to 12 fathoms.

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*Lat. 35°40′.0, Long. 121°17′.0: Chart 5302.

La Cruz Rock, 48 feet high, is fairly prominent. It is situated about 2.8 miles north-northwestward of Piedras Blancas Light and just southward of Point Sierra Nevada. A sandy beach inshore from La Cruz Rock affords a favorable landing place in heavy northwesterly weather. This stretch of beach is free from breakers. There is a suitable anchorage, in heavy northwesterly weather and also in light southerly weather, for small boats, east of the northerly limits of La Cruz Rock.

Point Sierra Nevada, a low inconspicuous bluff, is named for the wreck of the steamship *Sierra Nevada* on the rocks 400 yards northwestward of the point.

A group of isolated buildings lie inland from **Breaker Point,** which is not prominent nor easily identified.

The off-lying rocks and kelp terminate at **Ragged Point,** a low projecting point made conspicuous by the visible rocks and ledges extending about 0.25 mile westward, and readily identified since it is the first point southward of the prominent valley, **Arroyo San Carpoforo.**

From Arroyo San Carpoforo northward to the Sur River, about 41 miles, the coast is very bold and rugged. The cliffs are 200 to 500 feet high and the land rises rapidly to elevations of 2,500 to 5,000 feet within 2 to 3 miles from the coast. There are few beaches and few outlying rocks. A highway skirts the shoreline, varying in elevation from 100 to 500 feet above water, and is plainly visible from seaward.

Northbound coasting steamers keep close inshore from Ragged Point to within 6 miles of Point Sur during northwesterly weather, and thus obtain considerable lee.

Two conspicuous landmarks lie between Ragged Point and Cape San Martin. **White Rock No. 1,** 39 feet high and rather sharp, lies about 0.5 mile offshore and 3.8 miles northwestward of Ragged Point; about 200 yards due westward of White Rock No. 1 is a rock awash at MLLW.

White Rock No. 2, 64 feet high, with a rounded top, lies about 0.25 mile offshore and 4.5 miles southeastward of Cape San Martin.

Salmon Cone, 500 feet high, is a rocky butte close to the shore and about 0.5 mile northward of White Rock No. 1; it is not conspicuous as it blends into the background.

Several deep narrow gulches or canyons indent the coast from Salmon Cone to Cape San Martin. Two of the most prominent, **Villa Canyon** and **Alder Creek,** are crossed by conspicuous white bridges.

A pinnacle rock, with a least depth of 1¾ fathoms lies about 1.75 miles southeastward of Cape San Martin and 0.5 mile offshore.

Whaleboat Rock, baring 5 feet at MLLW, and **Bird Rock,** 5 feet high, are two off-lying rocks, lying about a mile southeastward of Cape San Martin; they are conspicuous only when coasting close inshore. A prominent white barn in a group of buildings is situated on the bluff just northward of these rocks.

Cape San Martin, 16 miles northwestward of Point Piedras Blancas, presents a ragged precipitous seaward face and is well identified by the **San Martin Rocks.** From southward, the inner rock, which lies about 100 yards offshore, is the most prominent, being 144 feet high and white in appearance. The middle rock is 34 feet high, triangular shaped, and lies midway between the inner and outer rocks. The outer rock is cone-shaped, 44 feet high, and is about 0.5 mile offshore.

Cape San Martin Light,* shown from a white structure near the western extremity of the cape, is 200 feet above the water and visible 11 miles. The structure is not conspicuous.

*Lat. 35°53′.3, Long. 121°27′.8: Charts 5302, 5002, 5020.

Willow Creek Bridge, about 0.3 mile northward of the light, is prominent from westward.

From Cape San Martin to Lopez Point, the coast forms an open bight 10 miles long and 2 miles wide with rugged shores intersected occasionally by deep narrow valleys. There are a few detached rocks, but with two exceptions, they do not extend far from the shoreline.

Plaskett Rock is a large prominent white rock, 110 feet high, about 2 miles northward of Cape San Martin, and lying about 0.3 mile offshore.

Tide Rock is a small black rock, awash, situated 4 miles northward of Cape San Martin and 0.7 mile offshore. The rock is quite sharp and constitutes a particular menace in smooth weather as there is no breaker to indicate its position.

Lopez Point is a narrow tableland, 100 feet high, projecting a short distance from the highland. **Lopez Rock,** 51 feet high, lies 0.3 mile offshore and about 0.8 mile northwestward of Lopez Point. A shoal of 6 fathoms lies 0.3 mile southwestward of Lopez Rock.

An open anchorage, affording some protection from northwesterly weather, may be had about 1 mile southeastward of Lopez Point in 10 fathoms, sandy bottom. Smaller vessels may obtain better shelter by anchoring inside of the kelp bed in about 5 fathoms, sandy bottom, with Lopez Point bearing about 287°. A rock having a depth of 1½ fathoms over it, lies in the kelp beds about 0.5 mile southeastward of Lopez Point.

Harlan Rock, 10 feet high, lies 0.3 mile offshore, about 1.7 miles east-southeastward of Lopez Point. It is conspicuous only when approaching the anchorage. A shoal of ¾ fathom lies 680 yards 127° from Harlan Rock.

In clear weather Junipero Serra Peak, and Twin and Cone Peaks, are prominent in this vicinity. **Junipero Serra Peak,** 5,844 feet high, lies about 10 miles northeastward of Lopez Point; there are pines on and near the summit. The peak is more prominent when well offshore than close in, owing to the high land between it and the coast.

Twin Peak, 4,700 feet high, and **Cone Peak,** 5,020 feet high, known to coasting mariners as **Twin Peaks,** are situated about 3 miles back from the coast and 4 miles northeastward of Lopez Point. Both peaks are in line on the bearing of 104°. They have scattered trees on their summits and are good landmarks even at night. There is an observation tower on the summit of Cone Peak which is lighted when occupied.

From Lopez Point to Pfeiffer Point, the coast is rugged, with high mountains rising precipitously from the shore. The coastline makes in slightly forming a shallow bight. Northbound coasting schooners keep about 1 or 2 miles offshore, and thus avoid the fresh northwesterly weather prevalent during the summer months. The highway, several hundred feet above the beach, is marked by numerous cuts.

Square Black Rock, 4 miles northward of Lopez Point, is 62 feet high and has a conspicuous cleft in its center. It is the most prominent landmark visible from offshore between Lopez Point and Pfeiffer Point.

Dolan Cone, 4.5 miles northward of Lopez Point, is white in appearance and 77 feet above the water.

Little Slate Rock, about 7.5 miles northward of Lopez Point, is 4 feet high; **Slate Rock** is 18 feet high. Both rocks are discernible only when close inshore.

A prominent dwelling visible from westward and northward is situated on a bluff about 5 miles southeastward of Pfeiffer Point. A number of conspicuous bridges connect the highway across the canyons. Some of these, notably an arch bridge over **Dolan Canyon** and a girder bridge over **Andersen Canyon** are visible well to seaward. The highway

leaves the coast about 3.5 miles southward of Pfeiffer Point and does not emerge again until northward of Point Sur.

A deep submarine valley makes in from the southward toward the shore in the bight located about 13.5 miles northward of Lopez Point and 4.5 miles southeastward of Pfeiffer Point. The head of the canyon parallels the shore for a distance of a mile and the 100-fathom curve lies only 500 yards from shore, 47 fathoms is found only 255 yards southward of Grimes Point.

PFEIFFER POINT TO POINT SUR

(CHART 5476)

Pfeiffer Point, about 17.5 miles northward of Lopez Point and 6 miles southward of Point Sur, is 400 to 500 feet high, and is the seaward termination of a long ridge 2,000 feet high 1.5 miles northeastward of the point. It presents a bold, precipitous, light-colored face to seaward. It is distinguished from the southward by its color; from the northward the pointed summit stands out prominently. The point is more prominent from northward than from southward. **Sycamore Canyon** lies immediately northward of Pfeiffer Point.

Anchorage, affording fair protection in northerly and northwesterly weather, may be had for small steamers about 0.9 mile east-southeastward of Pfeiffer Point and 0.5 mile offshore, in 10 fathoms, sandy bottom, with cable sufficient to clear the kelp line. Small boats may anchor in a bight in the kelp about 0.25 mile offshore, just northward of the anchorage, and obtain better protection. This anchorage is used extensively by local fishermen. Access by land is difficult as the road is poor.

Cooper Point, lies 1.5 miles northwestward of Pfeiffer Point. It is marked by a prominent pinnacle 172 feet high, and an offlying rock, 18 feet high.

From the mouth of the **Sur River,** about 3.5 miles northward of Pfeiffer Point, to Point Sur, the shore is low, with sand beaches and sand dunes extending eastward. Numerous sunken rocks and ledges, extending in places a mile offshore, lie between Cooper Point and Point Sur.

False Sur, 206 feet high, is a rounded hillock of somewhat similar appearance to Point Sur, and during fog and low visibility may be mistaken for it. The hillock is close to the beach, about a mile southeastward of Point Sur.

Point Sur is a black, rocky butte, 362 feet high, with low sand dunes extending eastward from it for over 0.5 mile. From northward or southward, it is raised as an island, and in clear weather is visible about 25 miles. There are buildings on the summit of Point Sur which may confuse the stranger. **Point Sur Light*** is on the seaward face, shown from a gray stone tower on fog signal building. The light is 270 feet above the water, visible 23 miles; the fog signal is sounded on an air diaphone. A radiobeacon, equipped for distance finding, is located here.

Pico Blanco (Sur Peak), 3,680 feet high, lies about 4.5 miles east-northeastward of Point Sur, rising from the long ridge bordering the south side of Little Sur River. It is pointed and white-topped, and is prominent from both northward and southward of Point Sur, in clear weather.

Sur Rock, 1.8 miles 152° from Point Sur Light, is a rock, awash, nearly 0.8 mile offshore. A shoal with a least depth of 2 fathoms lies 0.25 mile westward of Point Sur and breaks heavily in all but very smooth weather. About 0.5 mile 236° from Sur Rock

*Lat. 36°18′.4, Long. 121°54′.0: Charts 5302, 5476, 5402, 5002, 6020, 9000.

is a shoal with 4½ fathoms over it that breaks in heavy weather. Extending 0.9 mile from Sur Rock toward Point Sur are a number of sunken rocks and dangers that show breakers in moderately smooth weather. Foul ground lies between the sunken rocks and the beach. These dangers are as a rule well marked by kelp, but it is a dangerous locality in thick or foggy weather, and when in this vicinity vessels should not shoal the depths to less than 30 fathoms.

The bank with 23 to 27 fathoms over sand and broken shells, which lies about 4 miles southwestward of Point Sur, was examined by means of the wire drag in 1934 and found to be free of dangers to surface navigation. There is slightly deeper water between it and the point. The 100-fathom curve extends about 8.5 miles to the westward of the point, and at a distance of 12.5 miles there is a depth of 400 fathoms.

Chapter 7.—POINT SUR TO POINT SAN PEDRO

(CHART 5402)

POINT SUR TO POINT CYPRESS

(CHART 5476)

From Point Sur the coast trends north-northwestward for 17 miles to Point Cypress, with Carmel Bay, a small open bight immediately southward of the latter point.

Monterey Bay, described on page 107, is a broad open bight 20 miles long and 9 miles wide, between Point Pinos and Point Santa Cruz. The shores decrease in height and boldness as Point Pinos is approached, while those of Monterey Bay are as a rule low and sandy. The valleys of the Salinas and Pajaro Rivers, which empty in the eastern part of Monterey Bay, cause a marked depression in the coast range of mountains that is prominent from a considerable distance seaward. From Point Santa Cruz, the coast trends in a gentle curve westward and northward for about 23 miles to Pigeon Point, and then extends for about 25 miles in a general north-northwesterly direction to Point San Pedro, the southern headland of the Gulf of the Farallons.

Southeastward of Monterey Bay the coast is bold, the 30-fathom curve lying in many places less than a mile from the shore. A deep submarine valley extends into Carmel Bay, and another enters about the middle of Monterey Bay, extending to the eastern shore with a depth of over 50 fathoms within 0.5 mile of the beach. Northward of Monterey Bay the soundings are more regular, and in thick weather the lead is a good guide. There are few dangers and these extend less than 1 mile offshore.

Just north of Point Sur there is a sandy beach and bluff which continue for about 1.8 miles to the **Little Sur River,** whence the coast becomes bold, the 30-fathom curve lying in many cases less than 1 mile from shore. The highway returns to the coast just north of Point Sur and is visible from seaward until it reaches Point Carmel. It is marked by a number of bridges.

Ventura Rocks, about 2.2 miles northward of Point Sur, are two rocks close together, about 0.6 mile offshore. The northern rock is conical-shaped and 12 feet high. It is fairly conspicuous when seen from the northward with the sand bluff north of Point Sur as a background, but when seen from the southward it is confused with the rocks near the beach and to the northward of the rocks. The southern rock is awash at HW.

From the noticeable valley of the Little Sur River, to Soberanes Point, a little over 7 miles, the coast although moderately straight, is bold, rugged, and broken with numerous detached rocks and sunken ledges lying close inshore.

Bixby Landing is identified by a prominent concrete arch bridge showing well to the westward but obscured to the northward. Another concrete arch bridge, less prominent, is situated on the north side of the 620-foot hill in this locality.

Soberanes Point projects but slightly from the general trend of the coast. An isolated, grassy hillock, 200 feet high, lies immediately back of the point, with a grassy ridge extending inland and rising to 1,600 feet in elevation.

The coastline from Soberanes Point to Carmel Point, about 4.6 miles, is rugged

and broken, but becomes less precipitous, and the ridges of mountains lessen in height, as Carmel Point is approached. There are innumerable rocks and ledges extending in some cases over 0.3 mile offshore.

Lobos Rocks, a group of small rocky islets, lie nearly 0.5 mile westward of Soberanes Point. The two larger islets are white-topped, and each is about 40 feet high. From seaward they rise abruptly from 20 fathoms, but there is foul ground between them.

Mount Carmel, 4,417 feet high, lies about 7.3 miles northeastward of Point Sur, and is round and bare on the summit. Mount Carmel and Pico Blanco can sometimes be seen when the lower land is shut in by fog or haze.

Yankee Point, about 2.5 miles northward of Soberanes Point, projects 0.3 mile from the general trend of the coast. The seaward face is irregular and broken with numerous detached rocks. **Yankee Point Rock,** 6 feet high, lies 125 yards westward of the point. A sunken rock, generally showing a breaker, lies 0.4 mile southward of the point and the same distance offshore.

Carmel Point, the extremity of **Point Lobos** and the southern point at the entrance to Carmel Bay, is an irregular, jagged, rocky point, 100 feet high. **Whalers Knoll,** 200 feet high, rocky and prominent, lies on the northern side, 0.5 mile from the western extremity of the point. Numerous detached rocks lie off the point; **Whaler Rock,** 12 feet high, 0.5 mile southwestward and similar in appearance to Point Cypress Rock, is the most conspicuous and the farthest offshore of the detached rocks. This rock is more prominent when seen from northward than from southward.

Carmel Bay is an open bight between Carmel Point and Point Cypress. It is about 2.8 miles long and 1.5 miles wide. The beach bordering the town of Carmel is low, but on the south side of the bay, the land is bare and mountainous and on the north side is hilly and heavily wooded. Carmel Bay affords shelter in northerly and southerly weather to small craft with local knowledge. In northerly weather anchorage may be had in two contracted coves on the northern shore locally called **Pebble Beach** (west) and **Stillwater Cove** (east). They are shallow, kelp-filled bights, with rock and gravel bottom. Anchorage is in 1 to 3 fathoms, but local knowledge is necessary to avoid the dangers. Stillwater Cove has a landing at its head with 5 feet alongside. In southerly weather anchorage may be had in **Carmel Cove,** a small indentation on the southern shore about a mile eastward of Point Carmel, in 3 to 4 fathoms, rock or gravel bottom, but there is a rock with 1¾ fathoms over it about the middle of the cove that contracts the anchorage. A small wharf near the now unused abalone cannery on the western side of the cove has 10 feet of water at its face. There is a small marine railway at this point capable of hauling out 30-foot boats.

Carmel Canyon, a deep submarine valley, heads in the southeastern part of the bay, with 50 fathoms within less than 0.25 mile of the beach.

Carmel Bay is not recommended for strangers, and no directions can be given that would be of any value.

On the northeastern shore of Carmel Bay and northward of **Carmel River,** is the city of **Carmel.** The lights of Carmel are prominent on a clear night. The Carmel Mission at the southern end of the town, is a prominent, isolated structure. Communication may be had by bus over good highways. There is no rail transportation at Carmel.

Point Cypress, the northern point at the entrance to Carmel Bay, is a comparatively low point extending about 2 miles beyond the general trend of the coast. The cliffs are steep, with numerous detached rocks close under them. The point is heavily wooded

to within 400 yards of its extremity. **Point Cypress Rock,** 12 feet high, lies 450 yards northwestward of Point Cypress, and is prominent from either northward or southward. A lighted gong buoy is moored northwestward of the point.

MONTEREY BAY

(CHART 5403)

From Point Cypress to Point Pinos, the coast trends northeastward for about 4 miles. Numerous small rocks and ledges closely border the shoreline. The land is low with the height of the cliffs decreasing towards **Point Joe,** formerly called **Pyramid Point,** a rocky extension of the shoreline where the surf breaks heavily. From this point to Point Pinos, the coast is covered with white sand dunes that are conspicuous, even in moonlight, when contrasted with the dark trees behind them.

Point Pinos, the southern point at the entrance to Monterey Bay, is low, rocky, and rounding, with visible rocks extending offshore for less than 0.25 mile. The point is bare for about 0.25 mile back from the beach, and beyond that is covered with pines. **Point Pinos Light,*** near the northern end of the point, is shown from a white tower on dwelling. The light is 89 feet above the water, visible 15 miles. Point Pinos lighted whistle buoy is moored about 0.8 mile northwestward of the light.

Point Pinos fog signal is an air diaphragm horn located 535 yards northwestward of the light.

Monterey Bay, between Point Pinos and Point Santa Cruz, is a broad, open roadstead 20 miles long and 9 miles wide. The shores are low, with sand beaches backed by sand dunes, or low, sandy bluffs. The low land extending eastward, from about the middle of the bay, is a prominent feature from seaward, as it forms the break between the Santa Lucia mountain range southward and the high land of the Santa Cruz Mountains northward. The bay is free of dangers, the 10-fathom curve lying at an average distance of 0.7 mile offshore. The lead is a good guide in thick weather. A submarine valley heads near the middle of the bay with a depth of over 50 fathoms about 0.6 mile from the beach near Moss Landing. Shelter from northwesterly winds is afforded at Santa Cruz Harbor and Soquel Cove, off the northern shore of the bay, and from southeasterly winds at Monterey Harbor, off the southern shore. The tidal currents are weak.

Pacific Grove, an important summer resort, is situated just southeastward of Point Pinos. There are no wharves here, all shipping being done from Monterey.

Monterey Harbor, 3 miles southeastward of Point Pinos, affords good shelter in southerly weather. It is an oil shipping port of some importance, and has a small amount of domestic commerce, mostly lumber, by water. It is the home port for a large fishing fleet, and there are several canneries, canning sardines and abalone.

Landmarks.—Either the aluminum-colored gas tank, 131 feet high, or the radio mast near the inner end of the municipal wharf makes a good leading mark when approaching this wharf. The Presidio Monument, built of granite, is prominently situated on the brow of a barren hill. The group of large aluminum-colored oil tanks on the beach at Seaside is very conspicuous. A lone water tank on top of a sand dune, 118 feet above the water, is distinctive.

A breakwater extends from the foot of Spence Street in an easterly direction for about 1,700 feet. This affords excellent protection in northwesterly weather to the

*Lat. 36°38′.0, Long. 121°55′.9: Charts 5402, 5403, 5002, 5020, 9000.

large fishing fleet that bases at Monterey, and is a protection to the municipal wharf. The outer end of the breakwater is marked by an unwatched light. Since the construction of the breakwater, the harbor has been filling with sand. The fish wharves which formerly had plenty of water are now bare at low tide. Soundings taken at the municipal wharf indicate slight shoaling.

The municipal wharf is about 1,600 feet long and 86 feet wide at the outer end. There were depths of 23 feet along the eastern face at the transit shed and 24 feet along the western face in 1937. Freight and supplies are handled by trucks over the wharf. There is a fog signal (electric bell) on the northern end of the wharf. There is considerable surge here, and at times it seriously interferes with loading operations.

Monterey was the capital of California under the Mexican rule, and for some time after it became a State. The old adobe customhouse is still standing.

Directions, from southward.—From a position 2.5 miles 240° from the Point Sur Light (position 6 of table 1 on page 42) steer **350°** for 17.8 miles, when Point Cypress and Point Cypress Rock should be abeam, distant 1.5 miles, and Point Pinos Light should bear 47°, distant 5 miles. Then steer **034°** for 5.75 miles, passing over 0.4 mile outside the lighted whistle buoy. Round Point Pinos at a distance of a little over 1 mile from the light, and steer **128°** so as to leave the lighted bell buoy to southward close-to. When about 0.5 mile past the lighted bell buoy steer **169°** and anchor as desired.

From northward.—From a position 2.0 miles 210° from Año Nuevo Island Light, steer **140°** for 35 miles, which should lead to a position 1.3 miles 52° from Point Pinos Light. Continue the course so as to leave the lighted bell buoy to southward. When about 0.5 mile past the buoy steer **169°** and anchor as desired.

Customs.—San Francisco is the port of entry for Monterey. There are no customs, quarantine, or immigration officials stationed at Monterey; however, there is a deputy customs office here.

Dockage.—A dockage charge is made of 2 cents a net registered ton for the first 200 tons and ¾ cent per ton for all over 200 tons.

Supplies.—Provisions may be had, and fresh water is piped to the dock. There are no facilities for obtaining fuel oil on the wharf, but launch fuels may be obtained.

There is a **chart agency** of the U. S. Coast and Geodetic Survey situated here.

Repairs.—There are small machine shops and facilities for repairing launches only.

Communications.—There is direct rail connection with San Francisco and occasional service by small coasting steamers. There are complete telegraph and telephone facilities.

A submerged fuel oil pipeline with floating connections has been installed at **Seaside,** about 1 mile eastward of the municipal wharf at Monterey, and tankers moor alongside this float to receive their cargo. Moorings are planted for holding the vessels in position.

Moss Landing, on the eastern shore of the bay, at the head of the great submarine valley, lies 12 miles northward of Point Pinos. The wharf, in poor condition, is used commercially, and has a depth of 50 feet at the end. The vessels make fast to mooring buoys and the wharf, and handle cargo by means of a derrick. Oil is handled over the wharf. The large aluminum-colored oil tank near the wharf is a prominent mark. The Pacific Highway passes through the town.

The anchorage off Moss Landing is unprotected, but the holding ground is good. The prevailing winds are northwesterly, with a few southeasterly and northerly gales during the winter season.

Elkhorn Slough empties into the bay about 1.3 miles northward of Moss Landing. There is a salt works on the slough.

Monterey Wind Gap.—The great mountain barriers northward and southward of Monterey Bay and the receding shoreline to the eastward offer a broad entrance to the cold, foggy northwesterly winds of the summer, and they drive over the bay and well into the Salinas Valley to the southward.

Soquel Cove is in the northeastern part of Monterey Bay, eastward of Santa Cruz Harbor. Fair shelter is afforded in northwesterly weather, but it is open in southerly weather. The best anchorage is southeastward of the mouth of **Soquel Creek,** in 5 to 6 fathoms, sandy bottom.

At Seacliff Beach, about 0.5 mile westward of Valencia Creek, a concrete ship has been beached and filled with sand; a pier extends from the beach to the ship.

Capitola is a summer resort and has a post office. There is a small wharf for fishing and pleasure purposes located here. Communication is by rail and bus, and there are telegraph and telephone facilities. A number of houses have been built on the bluffs about 1.5 miles eastward of Capitola, and considerable beach improvement has been made here.

Point Santa Cruz, lying about 19.5 miles 347° from Point Pinos, is flat, rising in terraces to higher land, and terminating in cliffs about 40 feet high, with two flat rocks close under the point, the outer one being the higher.

Santa Cruz Light,* on a white wooden tower 55 feet above the water and visible 13 miles, is situated near the southern extremity of the point, and is a good leading mark. The former lighthouse, a white tower on a dwelling, is 84 yards 342° from the light. Immediately back of the former lighthouse is a grove of trees higher than the lighthouse. There is no fog signal. A whistle buoy is moored about 1.1 miles 133° from the light.

Santa Cruz Harbor is on the northern shore of Monterey Bay between Point Santa Cruz and **Soquel Point.** The Casino Building, and roller coaster immediately to the eastward of it, are prominent in approaching.

There is a substantial municipal wharf built out to 28 feet with a cargo shed at its outer end. Landing may be made here in all but heavy southerly weather. Few vessels other than fishing boats land at this pier; due to the ocean swell sweeping around the point, there is usually considerable surge, and heavy lines are required.

Good shelter is afforded in Santa Cruz Harbor in northerly weather, but in northwesterly weather a heavy swell is apt to sweep into the anchorage. There is good anchorage anywhere off the wharf in 5 to 6 fathoms, sandy bottom. During southerly weather there is no protection, and vessels run to Monterey for shelter.

The city of **Santa Cruz** is situated on the northwestern shore of the bay. **Seabright, Del Mar,** and **Twin Lakes** are suburbs of Santa Cruz along the beach to the eastward.

Customs.—Santa Cruz is not a port of entry and there are no custom, quarantine, or immigration officials stationed here.

Supplies.—Provisions and launch fuels may be obtained and city water is piped to he dock.

Repairs.—There are no repair facilities except for machine work on launches. Launches up to lengths of 30 feet can be hoisted onto the wharf for hull repairs.

Communication.—There is rail connection with San Francisco and bus service with the interior.

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*Lat. 36°57′.1, Long. 122°01′.6: Charts 5402, 5403, 5002, 5020, 9000.

DIRECTIONS, SANTA CRUZ HARBOR

From southward.—From a position 2.5 miles 240° from Point Sur Light (position 6 of table 1, page 42), steer **350°** for 17.8 miles, when Point Cypress and Point Cypress Rock should be abeam, distant 1.5 miles, and Point Pinos Light should bear 47°, distant 5 miles; then steer **000°** for 22 miles, for the whistle buoy and thence to the anchorage off the wharf, as desired.

From northward.—From a position 2 miles 215° from the Año Nuevo Island Light, steer **132°** and give the coast a berth of over 1.5 miles. Continue this course 15 miles, and when Santa Cruz Light bears 76° steer **084°** for the whistle buoy and pass nearly 1 mile southward of the light. When the light is abeam, round it to the anchorage off the wharf.

POINT SANTA CRUZ TO MIRAMONTES POINT

(CHART 5402)

About 3.5 miles westward of Point Santa Cruz is an oil derrick, 80 feet in height, that is prominent by day in clear weather.

Needle Rock Point is 4 miles westward of Santa Cruz Light; a slender pillar of rock stands a short distance seaward from the face of the cliffs; another lower pinnacle stands about 200 yards eastward. Neither is distinguishable when abreast it. Two oil derricks in the vicinity of Needle Rock Point show well by day in clear weather.

From Point Santa Cruz the coast trends westward for about 4 miles to Needle Rock Point and then northwestward to Point Año Nuevo. The shoreline rises from high bluffs to a low, flat, tree-covered mountain range with a few intervening beaches.

Sandhill Bluff lies about 6.5 miles westward of Santa Cruz Light and 12 miles southeastward of Año Nuevo Island Light. The bluff is composed of sandstone cliffs about 50 feet high, with a rounding irregular hillock of white sand near the edge of the cliffs; this is white on the northwestern side, and covered with brush and grass on the southeastern side. Neither this bluff nor Needle Rock Point is a good landmark.

About 3.5 miles northwestward of Sandhill Bluff and 8.5 miles southeastward of Point Año Nuevo, are the large cement works at **Davenport.** The buildings are conspicuous from seaward; smoke from the works can be seen a long distance off by day, and numerous electric arc lights are visible at night. A large aluminum-colored oil tank is also a prominent mark. A steel wharf, about 2,500 feet long, enables vessels to load bulk cement; there are pipelines for both cement and oil. On account of the current and ground swell vessels must moor to lay off the dock; mooring buoys are provided. The outer end of the wharf is marked by a light.

There is a submarine pipeline for unloading fuel oil off **Scott Creek** about 2 miles northward of Davenport. The end of the pipeline and the ship moorings are marked by buoys.

Loma Prieta is a prominent flat-topped peak surmounting the high mountainous ridge about 13 miles north-northeastward of Santa Cruz Light. It is 3,798 feet high and is the predominating mountain feature of this section. There is a fire observation tower on the top of the peak.

Waddell Creek, eastward of Point Año Nuevo, is a narrow, steep-sided valley. The high, whitish bluffs, immediately northward, are quite prominent.

Point Año Nuevo is formed by sand dunes, 20 to 100 feet high. There are two radio masts on the point. A low, black, rocky islet lies 0.3 mile off the point. Foul ground extends northwestward and southeastward from the islet.

Año Nuevo Island Light, on a white square pyramidal skeleton tower, is located on the islet. The light is 73 feet above high water and visible 14 miles. A fog signal is sounded on an air diaphone. There is a group of red-roofed, white houses near the light.

There is a derrick on the eastern side of Point Año Nuevo which is used for hoisting lighthouse supplies which are usually landed on the sandy beach at the head of the cove. The lighthouse tender anchors off this cove but the anchorage is not recommended.

Anchorage with protection from northerly and northwesterly winds may be made in the bight southward of the point in 8 fathoms, with the light bearing 276°, distant 0.8 mile. The kelp bed and reef, extending a little over 0.5 mile southeastward from the islet, break the force of the swell.

Pigeon Point is about 5 miles northwestward of Point Año Nuevo, the coast between them being low and rocky. This point is about 50 feet high and rises in a gentle slope to the coast hills. Several moderately large, detached rocks extend 350 yards southwestward. Pigeon Point was named from the wreck at this place of the clippership *Carrier Pigeon.*

Pigeon Point Light* is on a white conical tower. The light is 148 feet above the water, and visible 18 miles. A fog signal is sounded on an air diaphone. The lighthouse buildings on the point are painted white with red roofs. There is a group of cream-colored farm buildings about 0.5 mile eastward; the barn is the most conspicuous.

Pigeon Point Light cannot be seen in the bight eastward of a line joining Pigeon Point and Pillar Point, about 19.5 miles 345° from it.

From Pigeon Point to **Pescadero Point,** about 4 miles, the coast is nearly straight and composed of reddish cliffs, with numerous outlying sunken and visible rocks. A rocky patch with a depth of 1¼ fathoms lies about 0.8 mile south by westward of Pescadero Point; a 6½-fathom rocky patch is located about 0.7 mile west-southwestward of the point.

From **Pescadero Creek,** about 1.5 miles northward of Pescadero Point, the coast for 8 miles northward becomes more broken and rugged, with yellow or white vertical cliffs. A prominent whitish cliff over 100 feet high, lies about 7.5 miles northward of Pescadero Point. The coast is broken by several small streams with deep, steep-sided valleys. Northward of the high cliff, a low flat tableland begins that extends northward for about 9 miles and then bends sharply westward to Pillar Point, forming Halfmoon Bay. The land consists generally of grass-covered, rolling hills with cultivated ground and ranch houses in the foreground.

HALFMOON BAY

(CHART 5520)

Halfmoon Bay lies northward of **Miramontes Point** and eastward of Pillar Point. The bay affords good shelter in northerly and northwesterly weather, but is exposed and dangerous in southerly weather. There is no water-borne traffic, all shipments being handled by truck to San Francisco.

Pillar Point, the southeastern extremity of a low ridge about 2.5 miles long, lies about 19.5 miles northwestward of Pigeon Point. It is 181 feet high with several black rocks extending over 300 yards southward. From northward these show as three or four rocks, but from southward appear as one. **Sail Rock** is the largest and southernmost rock, a pillar being situated at its southwestern extremity. Foul ground, well

*Lat. 37°10′.9, Long. 122°23′.6: Charts 5402, 5002, 5020, 9000.

marked by kelp, extends southeastward for over a mile. A buoy is moored about 350 yards southeastward from the end of the reef.

A bell buoy, 0.65 mile southwestward of Pillar Point, and a lighted buoy, about 1 mile southeastward, mark the dangers extending from Pillar Point.

Southeast Reef is a sunken reef 650 yards in length in a general northwesterly direction, with an average width of 100 yards. It has from 14 to 18 feet over it except on the southeastern end where there is a pinnacle rock with only 4 feet over it. The northern extremity lies 1.6 miles southeastward of Sail Rock. Depths of 30 feet and less extend northwestward from the reef for over 0.4 mile. A buoy is moored about 0.2 mile northwestward from the northern end of the reef. Another buoy is moored about 0.2 mile southeastward of the southern end of the reef.

Masters of coasting steamers bound for San Francisco do not use the South Channel over the bar if they see breakers on this reef.

Directions, Halfmoon Bay, from southward.—From a position 2.1 miles 250° from Pigeon Point Light (position 7 of table 1 on page 42), steer **355°** to a position 0.25 mile eastward of the buoy marking the southeastern extremity of Southeast Reef. Then steer **334°** heading for the wharf at the mouth of **Denniston Creek,** and select anchorage as desired.

From northward.—Round Point Montara at a distance of 2 miles. Steer **141°** for 4 miles passing 1.4 miles southwestward of Pillar Point. When Miramar schoolhouse cupola bears **058°**, steer for it on that bearing and pass 200 yards southward of the lighted buoy, then haul northward and anchor in the northern part of Halfmoon Bay as desired.

There are the ruins of a wharf on the eastern shore of the bight at **Miramar.** There are two wharves, 800 feet long, built out from the north shore of the bay at the village of **Princeton.** The wharves are used principally by fishing boats. Oil and gasoline are available on the wharves. Boats up to 50 feet long may be hoisted by davits on the eastern wharf or by derrick on the western wharf, for overhaul or for safety in bad weather.

The town of **Halfmoon Bay** lies about 2 miles southward of Miramar and nearly 1 mile inland. The buildings in the town are prominent, especially a church with a large tower. A limited amount of provisions can be obtained but no coal or water. The best anchorage is under Pillar Point, but vessels must be prepared to leave on the approach of southerly weather.

HALFMOON BAY TO POINT SAN PEDRO

(CHART 5402)

Montara Mountain, 1,940 feet high, lies about 4.5 miles northward of Pillar Point and 2.5 miles inland; it is covered with grass and bare of trees. From the southward it shows as a long ridge with several small elevations upon it, but from the northwestward, it appears as a flat-topped mountain with four knobs on the summit. It is a prominent feature in approaching the entrance to San Francisco Bay.

Point Montara, about 2.8 miles northward of Pillar Point, is the seaward end of a spur from Montara Mountain, and the northwestern extremity of the ridge forming Pillar Point. It terminates in cliffs about 60 feet high with numerous outlying rocks. Sunken rocks and ledges lie 0.8 mile westward of the point and extend in a northwesterly direction for about 1.5 miles. This is a dangerous locality in thick weather, and when inside the 30-fathom curve extreme caution should be used.

Point Montara Light,* on a white conical tower, is 70 feet above high water and

*Lat. 37°32′.1, Long. 122°31′.2: Charts 5402, 5502, 5002, 5024, 9000.

visible 14 miles. A fog signal is sounded on an air diaphone. A radio direction finder station is located near the lighthouse. A conspicuous white tank is near the station and in the daytime is more prominent than the light.

From Point Montara to Point San Pedro, the coast is bold and rugged, rising sharply from the sea to the spurs extending from Montara Mountain. Devils Slide is light-colored and is the highest bluff in this locality. Cuts for the highway are distinctive features in the bluffs. There are no outlying rocks or dangers other than those off Point Montara.

Point San Pedro is a dark, bold, rocky promontory, 640 feet high. It is the seaward termination of Montara Mountain and is an excellent mark in clear weather from either northward or southward. A large triple-headed rock, about 100 feet high, white on its southern face, projects 0.3 mile westward from the point. A rocky area, on which the sea breaks in a heavy swell, is reported to exist about a mile northward of the point.

Chapter 8.—POINT SAN PEDRO TO POINT ARENA

(CHART 5502)

SAN FRANCISCO BAY AND APPROACHES

(CHART 5502)

The approaches to San Francisco Bay are included in the area bounded on the north by Point Reyes, on the west by the Farallon Islands, and on the south by Point San Pedro. This body of water, known as the **Gulf of the Farallons,** is about 35 miles long in a northwesterly direction, with a greatest width of 23 miles, and connects eastward by a narrow entrance, the Golden Gate, with San Francisco Bay. The prominent and easily distinguished landfalls, and the numerous natural and artificial aids, make the navigation of the approaches comparatively simple in clear weather. In thick weather the currents, variable in direction and velocity, render the approaches difficult and dangerous, and strangers should either lie off and wait for clear weather or take a pilot. Point Reyes, page 150; Mount Tamalpais; the Farallon Islands; Point San Pedro, page 113; and Montara Mountain, page 112; are all prominent in clear weather, and can frequently be used to locate a vessel's position when the lower land near the beach is shut in by fog or haze. See "General Remarks on Approaching San Francisco Bay" page 119.

A flashing white airway beacon on **Mount Diablo,** bearing 83°, distant 30 miles from the Golden Gate, is operated from sunset to sunrise by private interests and should be visible in clear weather to vessels approaching San Francisco Harbor. Drakes Bay, eastward of Point Reyes, and Bolinas Bay, eastward of Duxbury Point, are open bights affording shelter in northwesterly weather, but exposed in southerly weather.

Farallon Island radio direction finder station, together with the Point Reyes and Point Montara stations, give the navigator an excellent opportunity to verify his position frequently by three radio bearings in approaching the Golden Gate in foggy weather, and it is an opportunity that should not be neglected.

Mount Tamalpais, about 7 miles northward of Point Bonita, is a prominent mountain, 2,604 feet high. In clear weather it is visible for over 60 miles. From southward and westward it shows three summits, of which the westernmost is the highest and the easternmost the sharpest. It is covered with bushes and scrub trees, giving it a dark appearance, which contrasts strongly with the surrounding hills, especially in summer, when the latter assume a light reddish color. There is a lookout tower on the eastern side of Mount Tamalpais which is prominent from the central portion of San Francisco Bay.

The **Farallon Islands** are a group of rocky islets extending about 7 miles in a northwesterly direction. The **Southeast Farallon,** the largest of the group, lies about 18 miles 177° from Point Reyes Light, and 23 miles 252° from Point Bonita. Actually it consists of two islands, separated by a narrow gorge impassable even for boats. The eastern one is the larger, pyramidal in shape, 350 feet high and surmounted by **Farallon Light,***

*Lat. 37°42′.0, Long. 123°00′.1: Charts 5502, 5002, 5020, 9000.

shown from a white conical tower. The light is 358 feet above water and visible 26 miles. A fog signal is sounded on an air diaphone. A radio beacon equipped for distance finding, and a radio direction finding station are located here. The fog signal, keeper's dwelling, and radio direction finder station are located on the low land on the southern side, and the fog signal can seldom be heard northwestward of the island.

Caution.—Do not rely on radio beacon bearings from ship's position when within 0.5 mile of Golden Gate Bridge.

The western and smaller island known as **Maintop** is 220 feet high. There are several rocky islets lying close-to, the largest of which, **Sugarloaf,** 200 feet high, lies northwestward of the light and forms a small cove where anchorage can be had in 8 fathoms on the line between the points. This islet has a small sand beach with a boat-landing on it. A submarine cable is laid from this cove to Drakes Bay. There is another boat-landing on the southern side of the island. Both are marked by derricks and landing stages.

Hurst Shoal lies 0.6 mile 152° from the light; it is of small extent, with a least depth of 4 fathoms, and breaks only in heavy weather.

The **Middle Farallon** lies about 2.3 miles northwestward of the light; it is a single black rock 50 yards in diameter and 20 feet high. A rock, with 5½ fathoms over it, lies 0.5 mile southwestward from it.

The **North Farallon Islands** lie about 6.5 miles northwestward of the light, and 14 miles south by westward of Point Reyes. They consist of two clusters of bare, precipitous islets and rocks extending in a west-northwesterly direction for 0.9 mile, with an average width of 0.3 mile. The highest rock, 155 feet, is in the southeastern group.

Noonday Rock, with 2¼ fathoms over it, lies 3 miles 296° from the northernmost rock of the North Farallons and 14 miles 209° from Point Reyes. It rises abruptly from depths of 20 fathoms and over, and is the pricipal danger in approaching from northward. It is marked by a red and black horizontally banded whistle buoy moored in about 26 fathoms, 400 yards southwestward of the rock, which is the shoalest point of **Fanny Shoal.** The latter is about 2 miles in extent, having depths of 20 to 30 fathoms. Noonday Rock derives its name from the clipper ship of that name which struck the rock in 1862 and within an hour sank in 40 fathoms.

Cordell Bank, least depth 22 fathoms, lies about 27 miles northwestward of Farallon Light. Between the bank and Point Reyes the depths increase to 66 fathoms; outside the bank the depths increase rapidly to 500 fathoms about 3 miles from the bank. Vessels from the northward are sometimes guided by soundings on Cordell Bank provided they can verify their soundings by the depths and characteristics of the bottom.

Point San Pedro is described on page 113.

From Point San Pedro to Point Lobos, the southern headland at the entrance, the coast extends about 11.5 miles in a north-northwesterly direction. The first 8 miles consist of whitish bluffs which at a point 5 miles northward of Point San Pedro reach a height of 600 feet. Between Point Lobos and these bluffs is a broad, sand beach extending back to high sand dunes, the latter terminating abruptly at Golden Gate Park, 1.5 miles southward of Point Lobos. These whitish sand dunes are prominent from a considerable distance seaward.

Shelter Cove is on the north side of San Pedro Point. It has been reported that boats may find shelter with good holding ground in this small cove from easterly storms. Shelter is also obtained from southerly storms due to the protection of **San Pedro Rock,** a small island, 150 feet high, close off the point. The bottom of the cove is gray sand to within 0.2 mile of the shore.

POINT LOBOS TO DUXBURY POINT

(APPROACH TO SAN FRANCISCO BAY)

(CHART 5532)

Point Lobos, the southern entrance point to Golden Gate, is high, rocky, and rounding, with black, rugged cliffs at its base. A marine lookout and reporting station is on the ridge back of the point, and the summit has upon it several houses and a large water tank on a high scaffolding. **Seal Rocks,** a group of high, rocky islets, lie close under its western face. The **Cliff House** and a number of other prominent buildings are situated on and near the southern point of its western face.

Point Bonita, the northern point at the entrance to Golden Gate, is a black, sharp, narrow, precipitous cliff, 100 feet high, increasing in height to 300 feet on its seaward face, 0.3 mile northward. From northwestward it shows as three heads, the southern one being cut down to form a foundation for **Point Bonita Light***, 124 feet above water, on a white tower, and visible 17 miles. A fog signal is sounded on an air diaphone. There is a radiobeacon equipped for distance finding. A single radio mast approximately 134 feet high is located 31.5 feet 53° from the light. In the summer the cliffs are white with bird droppings, but the first heavy rain restores them to their natural black color. There are a few detached rocks surrounding the point, but these do not extend over 200 yards offshore.

San Francisco Lightship is moored about 3 miles outside the bar, just northward of the entrance to the Main Ship Channel. In thick weather this channel is easily entered owing to the short run from the lightship to the bar. The lightship has a red hull with SAN FRANCISCO on each side, and two masts. The light is 65 feet above the water and visible 13 miles. There is a riding light on the forestay. The fog signal is sounded on an air diaphone; if the diaphone is disabled, a horn will be blown. There is a radiobeacon at the lightship equipped for distance finding. The lightship receives and transmits radio messages.

The **San Francisco bar** outside the entrance is semicircular in form, the area, with depths of 36 feet or less, extending from a point 0.5 mile westward of Point Bonita to a point nearly 1 mile offshore 3 miles southward of Point Lobos. The extreme outer point is about 5 miles west-southwestward of Point Bonita. A northern part is the shoalest and is known as **Potatopatch Shoal,** within the limits of which is a small area of less than 24 feet. The name is said to have originated from the fact that schooners from Bodega Bay frequently lost their deck loads of potatoes while crossing it. Over the remainder of the bar, except the dredged portion of the Main Ship Channel, the depths range from 31 to 36 feet, the deepest water being found near the southern end, which is nearly a mile wide. The depths as a rule vary but little from year to year, with a slight tendency to increase. The depths in approaching are regular and decrease gradually to about 48 feet and then abruptly to the crest of the bar. Inside the bar the depth increases slowly and regularly to the entrance.

Channels.—In smooth weather the bar can be crossed anywhere southward of the western end of the Potatopatch Shoal, but in heavy weather use is made of one of the following channels:

The **Main Ship Channel,** which has been the one in most general use, is now being improved by the Government. The project calls for a channel 50 feet deep and 2,000 feet wide on the bearing 70° toward the Alcatraz Island Light.

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*Lat. 37°48′.9, Long. 122°31′.7: Charts 5532, 5502, 5002, 5020, 9000.

In 1941 there was a least depth of 45 feet along the axis of the Main Ship Channel. † In_____ 19___, the controlling depth in the channel was:_____.

The **South Channel,** marked on its eastern side by two buoys, parallels the beach southward of Point Lobos at a distance of 0.8 mile, and at its southern end is 0.4 mile wide. Vessels entering this channel and heading for Point Bonita Light, bearing 356°, will find nothing less than 34 feet and as a rule deeper water. Deep-draft vessels may be taken through this channel with a southwesterly swell, and although the vessels may roll considerably, they pitch but little and hence lessen the possibility of touching from that cause. The South Channel, however, should not be used when the bar is rough and inclined to break, as heavy breakers, forming on the bar, sometimes sweep across the channel. (See remarks under Southeast Reef, page 112.)

The **Bonita Channel** lies between the eastern end of Potatopatch Shoal and the shore northward of Point Bonita. It is about 2 miles in length, and varies in width from 0.3 mile at its southern end, abreast Point Bonita, to 0.6 mile at the northern end. The navigable width is reduced to less than 0.2 mile by several rocky patches, the outer one being **Centissima Reef** with 33 feet over it. **Sears Rock,** with a least depth of 20 feet, lies 200 yards north-northwestward of Centissima Reef.

Near the position of Centissima Reef, a rock with 33 feet over it has been reported; its reported position is marked by a lighted bell buoy.

The southern portion of the channel is marked by a lighted range bearing 137°; Mile Rocks Light* is the front range, and a light shown from a white wooden building on the bluff is the rear range. The rear light is 326 feet above the water and is visible only on the range.

Bonita Channel carries a least depth of 54 feet. It has been used successfully by some of the largest vessels on the Pacific.

The **Golden Gate** is the connecting passage between the ocean and San Francisco Bay. The western end is 2 miles wide between Point Bonita and Point Lobos, but the channel width is reduced to 1.5 miles by Mile Rocks, off Point Lobos, thence it contracts to less than 0.9 mile between Lime Point on the northern shore and Fort Point on the southern. The depths increase from about 118 feet at the western end to over 360 feet near the eastern end. These depths, combined with the currents, render the lead of little value in thick weather. The northern shore is bold and rugged; the cliffs, reddish in color, rising abruptly from the water's edge to heights of over 600 feet.

Mile Rocks are two small black rocks lying 0.35 mile northwestward of the sharp projecting point off **Landsend** on the northern face of Point Lobos. The rocks are 20 feet high and about 100 feet apart, with deep water reported between them. An over head cable with a vertical clearance of 70 feet above MHW crosses from Landsend to Mile Rocks Light.

Mile Rocks Light, shown from a white cylindrical tower on dwelling situated on the outer and larger rock, is 78 feet above the water, and visible 14 miles. A fog signal is sounded on an air diaphone or if it is disabled, on an air whistle. When vessels are in distress, the fog signal will sound 5 or 6 short blasts and one longer blast to warn the Coast Guard.

A rock with 6 feet over it lies 130 yards eastward of Mile Rocks Light. The passage between Mile Rocks and Point Lobos should not be attempted, as a rock

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

*Lat 37°47'.6, Long. 122°30'.6: Charts 5532, 5502.

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with 15 feet over it lies 300 yards 164° from Mile Rocks Light, nearly in the middle of the passage, and sunken and visible rocks extend over 300 yards from the shore.

The southern shore of the Golden Gate extends in a gentle curve eastward and northward to Fort Point, forming a shallow bight known as **South Bay.** The cliffs rise abruptly from narrow beaches, except near the middle of the bight, where a valley terminates in a sand beach about 0.3 mile long. Sailing vessels are sometimes obliged to anchor here when becalmed or when meeting an ebb current, to avoid drifting on Mile Rocks, but the anchorage is uncomfortable and it is difficult to get underway from it.

Fort Point projects slightly from the high cliffs, and is marked by a square, red brick fort with a stone sea wall in front. The fort is obscured by the structure of the southern end of the Golden Gate Bridge.

The **Golden Gate Bridge** crosses the Golden Gate from Fort Point to Lime Point. The horizontal distance between towers is 4,200 feet; the towers are 740 feet above the water. The vertical clearance is 225 feet at the center and about 210 feet near the piers at MHHW.

The center of the span between the towers above the mid-channel area is marked by two navigational lights, one on the seaward side, the other on the bay side of the bridge; there is also a fog signal apparatus at the center. There is a light and a fog signal apparatus on the channel side of the south pier. The south pier and the mid-channel fog signals are synchronized, the characteristic signal of one occurring successively after the characteristic signal of the other. The south pier signal is sounded on an air diaphragm horn and the mid-channel signal on an air diaphone. Aviation obstruction lights mark the tops of the bridge towers.

San Francisco Bay is described on page 123.

Lime Point is high and precipitous and rises abruptly to a height of nearly 500 feet in less than 0.3 mile. The southern face shows the effect of blasting, and the rock in the vicinity of the light is whitewashed.

Lime Point Light* is located at the extremity of the point on a white brick building. The light is 19 feet above the water and is visible 9 miles. The fog signal is sounded on an air chime diaphragm horn. The horn sounds 5 or 6 short blasts and one longer blast to warn the Coast Guard when vessels are in distress.

From Lime Point to Point Diablo, the shore forms a shallow bight with steep, precipitous cliffs. Near the middle of the bight the cliffs are cut by a narrow valley which terminates in a low beach at the shore.

Point Diablo, about midway between Lime Point and Point Bonita, projects sharply into the strait for about 0.15 mile. It rises abruptly to a height of over 200 feet, with deep water on all three sides. The point is marked by **Point Diablo Light** on a white wooden house. The light is 50 feet above the water and visible 12 miles. A fog signal is sounded on an electric siren.

Bonita Cove, immediately eastward of Point Bonita, is occasionally used as an anchorage by small vessels. The anchorage is close under Point Bonita in about 36 feet and is used considerably by the pilot boats. There are two wharves built out in the western part of the cove, both belonging to the Government and used for landing lighthouse and military supplies. A Coast Guard station is located here.

Point Bonita and Point Bonita Light are described on page 116.

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*Lat. 37°49′.5, Long. 122°28′.6: Charts 5532, 5502.

From Point Bonita to Rocky Point, the coast is very rugged and broken. The cliffs, which are the seaward termination of spurs from Mount Tamalpais, rise to heights of over 500 feet and are intersected by deep, narrow valleys stretching inland.

Rocky Point, about 3.5 miles eastward of Duxbury Point, is 100 feet high and shelving. Numerous detached rocks lie within 200 yards of the cliffs, which on the southern side of the point are high and precipitous.

Bolinas Bay lies immediately eastward of Duxbury Point. It is an open bight about 3.5 miles long between Duxbury and Rocky Points, and a little over a mile wide. It affords shelter in northwesterly weather, in 24 to 36 feet, sandy bottom, with Duxbury Point bearing about 277°, distant 1.5 miles. This anchorage is seldom used. No directions are necessary other than to keep clear of Duxbury Reef and the dangers which are charted off the edge of this reef.

Bolinas Lagoon is separated from the bay by a narrow strip of sandy beach that is cut by a narrow shifting channel near the bluffs about the middle of the bight. The lagoon is shoal and of little commercial importance. It is entered by small, light-draft vessels with local knowledge. In December 1940, the controlling depth at the entrance was reported to be 3 feet. The village of **Bolinas** is located a short distance inside the entrance on the western shore. A Coast Guard station is located at Bolinas.

Bolinas Point is described on page 150.

Duxbury Point, 160 feet high and yellowish in color, lies about 5 miles southeastward of Double Point and 9.5 miles northwestward of Point Bonita. It forms the southern extremity of the tableland westward of Bolinas Lagoon.

Duxbury Reef, a dangerous reef upon which many vessels have been lost, is long, narrow, and partly bare at low water. It extends 1.2 miles southeastward from Duxbury Point. A ledge with from 30 to 36 feet over it, extends southward from the reef; its outer end lies 1.4 miles 183° from the point.

Duxbury Reef lighted whistle buoy is moored about 2 miles from Duxbury Point. Great care should be exercised in passing this reef. Vessels should not pass northward of the buoy.

For Duxbury Point to Point Reyes see page 150.

GENERAL REMARKS ON APPROACHING SAN FRANCISCO BAY

Vessels approaching San Francisco Bay in clear weather by day or night, will experience no dificulty in making a landfall, as the aids to navigation, both natural and artificial, are prominent and easily distinguished. **From northward,** vessels will make Point Reyes, and when abreast of the point, can lay a course for the lightship, observing proper care to avoid Noonday Rock northward of the North Farallon Islands; or they may use the Bonita Channel, as prudence and inclination direct. **From seaward,** vessels should make the Southeast Farallon Island and shape a course for the lightship. **From southward,** vessels should make the lightship or, if desiring to cross the bar southward of the Main Ship Channel, make Point Bonita Light and use the South Channel, or cross westward of the channel, as prudence and the condition of the bar warrant.

In approaching the entrance to San Francisco Bay use may be made of the **radio direction finder stations** as follows: The radio direction finder stations at Point Montara, Farallon Island, and Point Reyes, are so situated as to assist ships in approaching the entrance to San Francisco Bay.

Details concerning these stations and the procedure for obtaining bearings are given in *Radio Navigational Aids, H. O. Publication 205.* However, it is believed that the following additional information will be of interest to mariners.

Ships approaching San Francisco from westward, may expect bearings of about equal accuracy from all three of the radio direction finder stations. If the ship's position is not well known, these bearings should be sufficiently accurate to lead the ship in from a distance of about 200 miles, but they will be *leading* bearings only. At a distance of about 70 miles from the Golden Gate, the angle formed by the bearings from Point Reyes and Point Montara will be about 30° and the ship will be able to obtain an approximate position. As the coast is neared the positions will become more and more accurate whether the course is laid to pass to northward or southward of the Farallon Islands, although passing to southward is preferable as being free from obstructions.

Ships bound in through the Main Ship Channel should be able to come up to the lightship without difficulty, although Point Montara is quite likely to be erratic in the sector 310° to 320°, and Point Reyes is quite likely to be erratic in the sector 145° to 160°. From the lightship to the bar buoys, a distance of about 3 miles, all three stations should be accurate. If the draft of the ship or the weather conditions make it essential for the ship to use the channel, no attempt should be made to cross the bar unless the buoys are sighted. From the bar buoys to the Golden Gate, radio bearings from Farallon Island will probably show an increasing northerly deviation as the ship approaches Point Bonita. Apparently this change in deviation is due to the reflection of the radio waves from the cliffs northward of Point Bonita. Point Reyes should be quite accurate until the ship is within 0.5 mile of Point Bonita, with Point Montara questionable and dropping out altogether about 2 miles westward of the line between Point Bonita and Mile Rocks. From here on, visual bearings only should be used.

Ships approaching San Francisco from the north may expect accurate *leading* bearings from Farallon Island, but must not expect to fix their position accurately until within about 20 miles from the Farallons, due to the sharp angle of intersection of the bearings from Farallon Island and Point Reyes. Although reliable bearings should be obtained from both stations during this approach, principal dependence should be placed on those from Farallon Island. While rounding Point Reyes, erratic bearings may be expected from that station in the sector 150° to 210°; and, *if close under the cliffs of Point Reyes,* bearings from all three radio direction finder stations may be erratic.

If the ship is bound through the North or Bonita Channel, the course should be laid to converge gradually on the coast for a landfall. From Drakes Bay to Tennessee Point, radio bearings from both Point Reyes and Farallon Island should be reliable, with those from Point Montara of doubtful value. No attempt should be made to pass through Bonita Channel unless the ship's position has been determined by visual bearings prior to reaching Tennessee Point.

Ships approaching San Francisco from the southward may expect accurate *leading* bearings from Farallon Island, but must not expect to fix their position accurately until within about 20 miles from that island, due to the sharp angle of intersection of the bearings from Farallon Island and Point Montara. Although bearings from Montara should be reliable in the sector of reliable calibration as published in *Radio Navigational Aids H. O. 205,* principle dependence should be placed on the bearings from Farallon Island.

After a good position has been obtained by intersecting radio bearings from Faral-

lon Island and Point Montara, the ship, if bound through the South Channel, should lay a course to converge gradually on the coast for a landfall. Reliable radio bearings may be expected from all three radio direction finder stations until north of Point San Pedro, when Montara will become erratic. Bearings from Farallon Island may be depended upon until abeam of Seal Rocks, with bearings from Point Reyes generally good but not quite so reliable as those from Farallon. When fairly within the Golden Gate, Farallon bearings will be from 2° to 4° too far to the northward, while Point Reyes should be quite accurate.

In all of the above approaches to San Francisco Bay, ships equipped with radio direction finders of their own may obtain additional checks on their positions by cross bearings taken on the radiobeacons on Farallon Island and San Francisco Lightship.

In thick weather, which prevails during a considerable portion of the year, vessels approaching San Francisco from any direction must exercise great caution. The currents are variable and uncertain, at times attaining considerable velocity, see page 122. A detailed description of the conditions which may be encountered and the precautions which should be observed is given on page 127. The Main Ship Channel should be used unless the bar is inclined to break. If the bar is breaking, strangers should stand offshore and wait for more favorable conditions.

From southward, vessels make the fog signal at Pigeon Point or Point Año Nuevo and lay a course to pass about 4 miles off Point Montara, when the fog signal at that point should be made; the depths should not be shoaled to less than 25 fathoms. When abreast Point Montara, a course can be shaped for the lightship, and the lead will be a good guide in approaching it and the bar. The South Channel should be used only in clear weather and with a smooth or only moderately rough bar. Directions are given on page 122.

From seaward, vessels should exercise the greatest caution when inside of 100 fathoms, and if inside of 50 fathoms should head offshore and wait for clear weather or a pilot, unless the fog signal on the Southeast Farallon can be made. This signal cannot be heard well from northward, especially during northerly or northwesterly winds. If northward of the Farallon Islands, the 50-fathom curve followed southward, should lead within sound of the fog signal, after making which, a course can be shaped for the lightship.

From northward, vessels endeavor to make Point Reyes fog signal. This signal may not be heard in the bight northward of the point, but the lead will indicate the position. If inside the 30-fathom curve and the signal is not heard, the vessel should be put broad offshore. Under certain conditions of foggy weather, it has sometimes been found difficult to locate the fog signal, owing to deflection in the direction of the sound, but by following the 30-fathom curve closely a vessel can round the point safely. Vessels from northward are sometimes guided by soundings on Cordell Bank.

Strangers are advised not to use the Bonita Channel in thick weather. The approaches lead past Duxbury Reef, on which many vessels have been lost under similar conditions and after passing the reef; unless the buoys are plainly seen and distinguished, the channel, on account of its comparatively narrow width, is dangerous to those not thoroughly familiar with it. It may be used at any time when the aids can readily be seen, and at such times, if the bar is breaking, it should be used in preference to the Main Ship Channel. Directions are given on page 123.

Strangers without a pilot, after crossing the bar, are advised to anchor in about 10 fathoms and wait for a pilot or for clearing weather. Unless one is thoroughly familiar

with the characteristics of the fog signals in the entrance and the peculiarities of the currents, entering in thick weather is hazardous, as soundings are of little value in the Golden Gate.

Having the above considerations in mind, the directions given below, which connect with the coastwise directions given on pages 42 and 45, may be used to enter San Francisco by any of the above channels.

Tides.—The mean range of the tide at San Francisco is 3.9 feet. The range between mean lower low water and mean higher high water is 5.7 feet. A range of about 9 feet may occur at the time of maximum tides. Daily tide predictions for San Francisco (Golden Gate), together with differences for obtaining predictions for various other places throughout the bay and its tributaries, are given in the tide table, published annually in advance by the United States Coast and Geodetic Survey.

Currents.—Immediately outside the bar, there is a slight current to the northward and westward, known as the coast eddy current. The currents at the San Francisco Lightship are described in some detail under currents at lightships, page 33. The currents most affecting navigation in this vicinity are the tidal currents. Across the bar the flood current converges toward the entrance, and is felt sooner around Point Lobos and Point Bonita than across the Main Ship Channel. The ebb current spreads from the entrance over the bar, but the main strength is west-southwestward, parallel with the southern edge of the Potatopatch Shoal, and through the Main Ship Channel. In the Bonita Channel the ebb current is weak and of short duration, the flood current beginning so early that during the last half of the ebb in the Golden Gate the current in Bonita Channel forms an eddy flowing southeastward around Point Bonita into Bonita Cove.

In the vicinity of Mile Rocks the currents attain a considerable velocity within a few minutes after slack on both flood and ebb.

In the Golden Gate the flood current sets straight in, with a slight tendency toward the north shore, with heavy overfalls both at Lime Point and Fort Point when strong. It causes an eddy in the bight between Point Lobos and Fort Point. The ebb current has been observed to have a velocity of more than 6.5 knots between Lime Point and Fort Point and it sets from inside the bay on the north side toward the latter point. Like the flood current, it causes an eddy in the bight between Fort Point and Point Lobos, and a heavy rip and overfall reaching about 0.25 mile southward from Point Bonita.

Daily predictions of the times of slack water and the times and velocities of maximum flood and ebb in the Golden Gate, together with factors and differences for obtaining the times and velocities of the current for other points in San Francisco Bay, are given in the *Pacific Coast Current Tables*.

For additional notes on currents in the Golden Gate see page 127.

DIRECTIONS, SAN FRANCISCO ENTRANCE

By the South Channel.—From a position 2.1 miles 250° from Pigeon Point Light, position 7 of table 1 on page 42, steer **344°** for 22.5 miles until Point Montara Light bears 74°, distant 2 miles. Then steer **007°** for 13 miles to a position 400 yards 277° from buoy No. 2 S. Then steer **357°**, heading for Point Bonita Light, for 2.4 miles, passing 100 yards westward of buoy No. 4, and when Seal Rocks are abeam, distant 0.45

mile and Mile Rocks Light bears 46°, change to **033°** for 1.1 miles to Mile Rocks Light abeam, distant 0.25 mile. Then steer **049°** for 2.5 miles to the center of the Golden Gate Bridge.

By the Main Ship Channel.—Having made the lightship, position 8 of table 1 on page 42, steer **070°** until Point Bonita Light bears 344°. Four pairs of lighted buoys mark the bar section of the main channel. Then make good a **057°** course for 2.5 miles to the center of the Golden Gate Bridge.

By the Bonita Channel.—From a position 1.6 miles 225° from Point Reyes, position 2 of table 4 on page 45, steer **114°** for 18 miles to a position 0.3 mile 204° from Duxbury Reef lighted whistle buoy. Many vessels have been lost on Duxbury Reef, and great caution is essential on this course. The lead should be used constantly, and the vessel should be stopped a little short of her distance to the buoy to listen for its signal. Under no conditions should the vessel proceed beyond this point until the buoy has been located. From the buoy steer **102°** for 6.5 miles to 325 yards 357° from Bonita Channel lighted whistle buoy with Point Bonita Light bearing 122½°. Then steer **129°** for 1.5 miles, where Point Bonita Light will bear 102°, passing 175 yards southwestward of Bonita Channel lighted bell buoy off Centissima Reef. Then on Bonita Channel lighted range, of which Mile Rocks Light is the front range and a light on the bluff is the rear range, steer **137°** for 0.75 mile passing southwestward of Point Bonita Light, and to a position with the light bearing 356°, distant 0.45 mile. The California Palace of the Legion of Honor at Landsend, Point Lobos, is on the range and prominent. Then steer **073°** for 2.5 miles to the center of the Golden Gate Bridge.

Important.—Steamers leaving San Francisco Bay through the Bonita Channel on the ebb tide must mind their starboard helm when crossing the tide rip off Point Bonita. When the bow passes the rip the stern is thrown to port and unless promptly met, the vessel is headed straight for the rocks off the point.

Vessels favoring Potatopatch Shoal too closely have reported a set toward this shoal.

If bound for the anchorage off San Francisco see page 128. If bound for the northern part of the bay see page 136.

SAN FRANCISCO BAY

This is the most important as well as the largest harbor on the Pacific coast of the United States. It is landlocked and affords good shelter and anchorage in all weather. It is the terminus of several trans-Pacific lines of steamers and transcontinental railroads, and its commerce, both foreign and domestic, is extensive. Much of the local navigation is carried on by means of light-draft river steamers and barges that ascend the Sacramento and San Joaquin Rivers.

From its junction with San Pablo Bay between Point San Pedro and Point San Pablo, about 10 miles above the entrance, the bay extends southeastward nearly 40 miles. The eastern shore as a rule is low, and in the southern part, is composed of extensive marshes intersected by numerous, winding sloughs. For about 4.5 miles southeastward of Point San Pablo the shore is formed by a ridge of rolling, grassy hills. The western shore, northward of the entrance, is much bolder, than the eastern shore with only a few stretches of low marsh. From Fort Point the shore trends eastward for nearly 4 miles, and then rounds sharply southward for 10 miles, from which point marshes and flats, intersected by numerous sloughs, extend to the head of the bay. The

San Francisco waterfront extends from 1 mile eastward of Fort Point around to Point Avisadero, a distance of about 8 miles. The first two points within the bay are Point Cavallo on the northern side, and Black Point on the southern side. Beyond these the islands within the bay are the most prominent features.

Fogs.—In common with the more northerly section of the Pacific Coast of the United States, the vicinity of the Golden Gate experiences fogs more frequently during the summer months than during the other periods of the year. These fogs are generally brought in from seaward by westerly winds, about sundown, and ordinarily continue until about noon of the following day. In winter, morning or "tule" fogs frequently occur, these forming over the lowlands of the central valley and over the bay. A table in the appendix on page 379, gives the hours of operation of various fog signals.

Prevailing winds.—Westerly winds prevail in this section of the Pacific Coast throughout the greater part of the year. In July and August southwesterly winds prevail, while northerly winds are most prevalent during the months of December and January. Southerly gales are not infrequent in the winter. The wind normally attains its greatest velocity about 4:30 p.m. and its least about 6 a.m.

During certain portions of the year, especially in May and June, the northwesterly winds attain high velocity. This is also true regarding the north-northeasterly winds of November, December, and occasionally January. In the winter the most prevalent high wind is from the southeast and is followed by a southwesterly wind. The former is the wind which precedes winter storms in this section.

The San Francisco Bay section, however, has comparatively few storms. Except in the winter very few low-pressure areas move from the ocean across California, nearly all the storms that enter the United States from the west passing far northward of central California.

Wire-drag surveys.—The Golden Gate and main channels of San Francisco Bay have been swept by the wire drag, and all dangers within this area are charted. The area swept includes the Golden Gate and narrows, the upper bay to Point San Pedro, and the lower bay to Point Avisadero.

SAN FRANCISCO

(CHART 5535)

There is a Coast Guard Station a short distance eastward of Fort Point.

Point Cavallo is a sharp rocky point with some visible sunken rocks close under its western face. It lies about 0.5 mile north-northeastward of Lime Point, and between them is **Horseshoe Bay,** a shallow bight within the area of forbidden anchorages. From Point Cavallo the rocky, steep shore trends northward 0.3 mile to **Yellow Bluff,** thence northwestward to Sausalito.

Presidio Shoal, the western end of which is a little over 0.5 mile eastward of Fort Point, has been dredged to a controlling depth of 40 feet.

Anita Rock, bare at low water, lies about 300 yards northward of the Presidio wharf. It is marked by a buoy on the eastern side and a horizontally banded bell buoy on the western side.

Yacht Harbor.—There is a yacht harbor and anchorage 0.5 mile eastward of Anita Rock.

Black Point* is the first prominent rocky eminence on the southern shore after passing Fort Point, and lies about 2.3 miles eastward from it. It marks the limit beyond which vessels must not pass before obtaining practique. Beyond Black Point and showing just to the left of it when entering the bay, is a large and prominent gas tank. This is located at the foot of Powell Street. There is also a prominent brick chimney on the eastern side of the point.

The **United States military reservations,** embracing Fort Point and Black Point, are on the northern shore of the peninsula.

Aquatic Park, on the eastern side of Black Point, is a small pleasure resort with a bathing beach and a curved recreation pier built out from Black Point.

A fog signal has been established on Pier 3 just westward of Black Point. It is an electric siren.

Telegraph Hill, about 1 mile eastward of Black Point, is surmounted by a tall cylindrical light-colored tower known as **Coit Tower.** It affords an excellent landmark by day, and also by night when the tower is frequently floodlighted.

Alcatraz Island, 2.5 miles eastward of Lime Point and 1 mile northward of Black Point, is prominent in the approaches, and is one of the leading marks in entering from seaward. The island is small, 148 feet high, and there are numerous buildings of the prison located upon it. **Alcatraz Light,** situated on the highest part of the island, is shown from a gray tower. The light is 214 feet above water, visible 21 miles. Fog signals are located on the extreme northwestern and southeastern ends of the island. Both fog signals are sounded on electric horns.

Unless authorized, vessels are prohibited from navigating within 200 yards of the shoreline of Alcatraz Island. Buoys with red and black vertical stripes mark the restricted area around Alcatraz Island.

A rock awash, marked on its westerly side by a horizontally striped bell buoy, lies 125 yards westward of the northwestern end of Alcatraz Island.

Yerba Buena Island, about 345 feet high, lies 2.5 miles eastward of Alcatraz Island. It is of small extent and irregular in shape, and is covered with a scrubby growth of trees. On the summit of the island is a wide square frame lookout tower. The wharves of the Naval Training Station and Army Engineers are in the small cove on the eastern face of the island. There is a light on the end of the southernmost wharf 18 feet above the water.

Yerba Buena Island Light, on a white octagonal wooden tower, is located at the extreme southeastern point of the island. The buildings are white and part of the bluff is whitewashed to make the station more discernible. The light is 95 feet above the water, visible 16 miles. A fog signal is sounded on an air diaphone.

Treasure Island is a low flat filled area northward of, and connected by a causeway to Yerba Buena Island. The island was made for the San Francisco International Exposition of 1940. Most of the buildings have been removed to make way for an airport. An obstruction extends from the western side and is marked by a lighted buoy off the outer end. A lighted bell buoy marks the shoal northwestward of the island.

San Francisco-Oakland Bay Bridge crosses the bay between **Rincon Point** in San Francisco and Yerba Buena Island, the west crossing, and between Yerba Buena Island and the vicinity of Key Route ferry terminal in Oakland, the east crossing. The maximum vertical clearance is 218 feet. On the chart, the piers are lettered for the sake of

*Lat. 37°48′.5, Long. 122°25′.5: Charts 5402, 5502, 5532, 5535,

reference and a note gives the system of aids to navigation and vertical clearances between piers.

The fog signals on the piers operate in the order named below.

	Pier
WEST CROSSING:	
Siren	A
Bell	C (southwest side)
Siren	E
Siren	B
Bell	C (northeast side)
Siren	D
EAST CROSSING:	
Siren	G
Bell	J
Siren	H
Bell	I
Bell	K

San Francisco, the largest city in the bay, is situated on the northern end of the peninsula separating the southern arm of the bay from the ocean. The depths at the wharves are ample for deep-draft vessels, and are maintained by dredging. The wharves or piers are designated by numbers beginning at the ferry building. All piers northwestward of it are given odd numbers and all southeastward, even numbers.

The port of San Francisco is under the control of the State of California and its management is vested in the Board of State Harbor Commissioners. The office of the chief wharfinger is on the **Embarcadero,** just north of the ferry building. The port maintains extensive terminals with belt-line rail connections and modern cargo-handling facilities.

Channels.—From the Golden Gate to the anchorage off San Francisco and southward to Point Avisadero, and northward to the entrance of San Pablo Bay, the channels are wide, and have ample depth for deep-draft vessels.

China Basin, located just northwestward of **Mission Rock,** is used principally as a lumber terminal, and is also a car-ferry terminal of the Santa Fe Railroad. A dredged slip, crossed by several drawbridges, extends about 0.5 mile in a southwesterly direction from the basin. This channel is used by coastwise vessels in the lumber trade.

Islais Creek, just southward of Potrero Point, has been improved by dredging, and there was 33.5 feet in the entrance channel with depths of 30 feet along the wharves in 1933. The project depth for the entrance channel is 35 feet.

Blossom Rock lies nearly 1 mile 113° from the southeastern end of Alcatraz Island and has a depth of 40 feet over it. Heavy tide rips occur in the vicinity of the rock.

Pilotage into and out of San Francisco Bay is compulsory for all foreign vessels and all vessels from or to a foreign port and all vessels sailing under a register between the port of San Francisco and any other port of the United States. All vessels sailing under an enrollment and licensed and engaged in the coasting trade between the port of San Francisco and any other port of the United States are exempt from pilotage, unless a pilot is actually employed. Full details of the Rules and Regulations, and rates may be secured from the Bay Pilots Association, Ferry Building, San Francisco.

Pilots.—The San Francisco pilot boats keep station between the lightship and the bar. When on station under sail, a white light is carried at the masthead; when under power, a red light is displayed under the white light. A flare or torch is also burned frequently. To signal for a pilot in fog, approach the lightship as closely as possible, blow four whistles, and lie-to. In answer, the pilot boat will sound four blasts

on the electric siren. When clear, burn blue light, or show 4 flashes of the Morse lamp, or by day show the Union Jack at the fore. Pilot boats fly the Union Jack at the mainmast.

Towboats may be had at San Francisco, but they no longer cruise off the bar. Under favorable conditions of wind and tide, sailing vessels do not require them when entering, but strangers are advised to take on a pilot.

Quarantine.—Quarantine regulations for San Francisco Bay are embodied in the national quarantine regulations.

Vessels are boarded westward of Black Point at the temporary anchorage, and if subject to inspection should not pass a line drawn from Alcatraz Island to Black Point until boarded by the doctor. When awaiting or undergoing examination, vessels must anchor in the space shown on chart 5532 as "Temporary Anchorage."

The national quarantine station is at Hospital Cove, Angel Island. Vessels should in no case proceed to Hospital Cove unless so directed by the quarantine officer.

The quarantine anchorage is situated in the channel leading to San Pablo Bay, midway between Bluff and San Quentin Points, about 3 miles north-northwestward of Angel Island. It is no longer marked with buoys, and vessels use the anchorage only when so directed by the quarantine officer.

Customs.—The customhouse is located at the corner of Washington and Battery Streets.

Immigration.—The United States immigration detention station is located on Angel Island. The main office is located at 801 Silver Avenue. The Bureau also maintains a branch immigration station in the customhouse.

The **marine hospital** is situated in the western part of San Francisco at Fourteenth Avenue and Lake Street. The service has a dispensary in the Old Mint Building at 5th and Mission Streets where out-patients are treated by an officer of the service, who is also the proper person to whom to apply for admission to the hospital.

Anchorage.—The usual anchorage for vessels is northwestward of Yerba Buena Island, and in the general anchorage off Mission Rock. The limits of the anchorage grounds prescribed by the War Department are shown on chart 5532. Anchorage regulations are enforced by an officer of the Coast Guard designated as Captain of the Port, with offices in the customhouse. A pamphlet giving the limits of the anchorages and the rules and regulations thereof may be procured from the chief wharfinger's office.

Harbor regulations are prescribed by the Board of State Harbor Commissioners, and their enforcement is in charge of the Chief Wharfinger and his assistants, who will furnish copies of the rules on application.

Tides.—See page 122.

Currents.—Inside the Golden Gate the flood current sets mainly north-northeasterly and causes swirls from the Golden Gate as far eastward as Alcatraz and Angel Islands and through Raccoon Strait, northward of the latter island. The ebb current, inside the Golden Gate, is felt first along the southern shore. In the Golden Gate, the duration of the ebb stream is somewhat greater than that of the flood. At periods of great freshets in the Sacramento and San Joaquin Rivers, there have been instances of very slight surface current, or none at all, on the small flood in the Golden Gate.

Along the water front of San Francisco, the current turns from flood to ebb ap-

proximately two hours earlier than in the Golden Gate; and from ebb to flood 1½ hours earlier than in the Golden Gate. Farther out in the bay the current turns somewhat later.

Vessels entering San Francisco Bay on a strong flood tide, and passing the south pier of the Golden Gate Bridge close aboard, often experience a strong sheer to starboard, which in a long vessel cannot be overcome readily by the rudder. This sheer has caused confusion in vessels approaching head-on in this locality.

At the San Francisco-Oakland Bay Bridge there are large current eddies near the foundation piers which cause ships to sheer off course.

The flow of the tidal currents throughout San Francisco Bay is clearly depicted on the *Tidal Current Charts, San Francisco,* published by the United States Coast and Geodetic Survey. This publication consists of a set of 12 charts which show the hourly direction and velocity of the tidal currents. The charts present a comprehensive view of the tidal current movement for the bay as a whole. They are also very useful in supplying a means of readily determining for any time the direction and velocity of the tidal currents at various localities throughout the bay. The charts, which may be used for any year, are referred to the times of the maximum flood and ebb currents at San Francisco Bay entrance (Golden Gate), daily predictions for which are included in the *Pacific Coast Current Tables.*

For further discussion of currents, in San Francisco entrance, see page 122.

Bridges.—There are four bridges over the tributary waterways within the city of San Francisco. The three crossing Channel Street and their dimensions are as follows: The Third Street Bridge is a single-leaf bascule type with a horizontal clearance of 103 feet and a vertical clearance of 1.5 feet above MHW; the opening signal is 4 long blasts. The Fourth Street Bridge is a single-leaf bascule type with a horizontal clearance of 75 feet and a vertical clearance of 8 feet above MHW; the opening signal is 3 long blasts. The Sixth Street Bridge is a swing type with a horizontal clearance of 50 feet in each channel and a vertical clearance of 7 feet at MHW; the opening signal is 6 long blasts. The bridge crossing Islais Creek at Third Street is a bascule type with a horizontal clearance of 75 feet and no vertical clearance at MHW; the opening signal is 3 long blasts. With the exception of the Sixth Street Bridge across Channel Street, all the bridges over navigable waterways within the city limits of San Francisco are in operation during the 24 hours except from 7 a. m. to 8 a. m., from 12 noon to 1 p. m., and from 4:30 p. m. to 6 p. m. The Sixth Street Bridge is seldom used, and its hours of operation extend from 8 a. m. to 4 p. m.

Directions to anchorage off San Francisco.—From the center of Golden Gate Bridge steer **093°** for 2.65 miles, heading for the northeastern point of Yerba Buena Island and passing 0.5 mile southward of Alcatraz Island Light. Then haul southward and follow the waterfront of San Francisco at a distance of about 0.5 mile. Anchor as desired in any of the anchorages shown on chart 5532.

Dockage charges.—The charge made for vessels occupying berths at the wharves or moored in any slip or channel, vary with the size and class of vessel, and toll charges, the charge made for merchandise passing over State premises, vary with the class of merchandise.

Tariff charges for dockage, tolls, demurrage, and rentals may be had on application to the Chief Wharfinger.

Supplies.—Coal, fuel oils, provisions, and ship chandler's stores may be had in any desired quantity. Fuel oil is usually delivered by barge, for which there is no extra

charge. Coal can be had at the wharves or in lighters. Water can be obtained on the wharves or by water boat.

Repairs.—Repairs to vessels and machinery of all kinds and sizes can be made. The largest dock is the graving dock at Hunter Point. It has a length of 1,020 feet, breadth at top 153 feet, and at bottom 110 feet. It will take a vessel drawing 40 feet. There are several smaller drydocks on the San Francisco side, and several marine railways and floating docks on the Oakland side.

Communications.—San Francisco is the terminus of several trans-Pacific steamship lines and is the port of call of numerous lines of coastal and intercoastal vessels. It is served by four lines of transcontinental railroads, and has through rail connection with all points to northward and southward. There is excellent air service. A large fleet of river steamers plies on the Sacramento and San Joaquin Rivers, and there is an extensive interbay steamer service. There are complete radio, telegraph, and telephone facilities. It is the terminus of a trans-Pacific cable via Honolulu and Midway Island.

A **Coast and Geodetic Survey District Office** is located at 114 Customhouse, San Francisco, where information relating to the coasts of the United States, Alaska, Hawaii, and the Philippine Islands is furnished without charge. The station also has for sale charts, coast pilots, current tables, tide tables, and other publications of the Coast and Geodetic Survey.

Mariners noting any dangers, changes in channels, shoals, etc., are urgently requested to forward the information to the supervisor in charge of the district office.

A **United States Branch Hydrographic Office** is located in the Merchants Exchange Building, San Francisco. Bulletins are posted here giving information of value to seamen, who are also enabled to avail themselves of publications pertaining to navigation, to compare barometers and chronometers, and to correct their charts from standards. No charge is made for this service.

The **United States Coast Guard District Headquarters** and the office of the **Captain of the Port** are located in the Customhouse.

Other Federal Activities are listed in tables in the Appendix.

There are **chart agencies** of the U. S. Coast and Geodetic Survey situated here.

The office of the **Chief Wharfinger** is in the Ferry Building.

Port Series No. 12 covers the port of San Francisco.

Yacht Clubs.—A list of the larger yacht clubs on the Pacific Coast is given in the Appendix.

Ranges for compass adjustment.—See table in the Appendix on page 373.

Storm-warning displays of the United States Weather Bureau are shown from a staff on the Telephone and Telegraph Building, and from a staff on the Marine Exchange Lookout Station, Pier 45, day only, and can be seen by vessels at anchor in the harbor.

SOUTH SAN FRANCISCO BAY

(CHART 5531)

Southward of San Francisco, **Point Avisadero,** which is the eastern extremity of **Hunter Point, Sierra Point, Point San Bruno,** and Point San Mateo, all on the western shore of the bay, are prominent natural features. **Point San Mateo** is covered by a heavy growth of trees and is raised as an island.

In former years there was an extensive oyster culture in the southern end of the bay, but recently this culture has been largely abandoned, due, it is said, to the increas-

ing oil pollution. The oyster house off **Millbrae** is the only one of several former houses on piling amongst the beds that remain. It is a prominent object.

There is an airway beacon at **San Francisco Airport** 1 mile southward of Point San Bruno. There are a seaplane landing channel and protected anchorage dredged to 10 feet. In June 1942, the controlling depth in the channel was 9 feet and in the anchorage area 9.5 feet. The channel is marked by buoys.

The San Mateo Bridge crossing the lower part of San Francisco Bay near **San Mateo,** has a vertical lift. The horizontal clearance is 270 feet, the vertical clearances above MHW are 35 feet when closed and 135 when open; the opening signal is 3 long blasts. A fog signal is sounded on an electric siren, on the westerly pier of the lift span.

An airway beacon is located about 3 miles southward of Point San Mateo.

Redwood Creek enters the bay at **Redwood** (formerly **Marsh**) **Point** about 4 miles southeastward of San Mateo Bridge. The creek has been improved by dredging an entrance channel and a turning basin, which are well marked. An overhead cable with a clearance of 125 feet crosses the entrance channel. In May 1942, the controlling depth in the improvement was 27 feet. †In_____ 19____, the controlling depth in the improvement was _____. The municipal wharf at the upper end of the turning basin has a face 450 feet in length. About 0.5 mile above the end of the turning basin, near the the upper end of the 7-foot channel, is the **Redwood City Yacht Harbor.** There are small piers and a clubhouse here. Gasoline, oil, water, and various supplies are available for yachtsmen. **Redwood City** is 3 miles from the mouth of the creek. The head of navigation is the bridge of the Bayshore Highway.

Westpoint Slough enters Redwood Creek at the lower end of the turning basin. There is a cement plant at this junction which is prominent, and can always be recognized by the cloud of dust that hangs about it. The shells in the old oyster beds are being utilized in the manufacture of cement, and consequently there is constant dredging on the former beds.

Ravenswood Point and **Dumbarton Point*** are at the head of the bay and the mouth of Coyote Creek. Two bridges and an aqueduct cross the bay at this point. The **Dumbarton Bridge,** the northern of the two, is a lift span with a horizontal clearance of 200 feet and vertical clearances at MHW of 9 feet when closed, and 135 feet when open. A fog signal is sounded on an electric siren on the western lift pier of the bridge. About 1,100 yards southeastward of the bridge are two flumes with a clear opening between them of about 900 yards, which supply the city of San Francisco with water. The eastern flume tunnels the entire way and is marked by a large sign with the word "PIPELINE". The western flume is carried on a trestle to a concrete house at the edge of the channel, where it tunnels. The railroad bridge is just southward of the tunnels. It has a swing span with a horizontal clearance of 125 feet and a vertical clearance of 13 feet above MHW. There is a fog bell on the bridge keeper's house. The opening signal for both bridges is 3 long blasts.

Coyote Creek has many sloughs entering it. The main channel is marked about 4 miles above the railroad bridge, **Calaveras Point,** and at the entrances to **Jagel Slough** and **Guadalupe River.** There is an overhead power cable crossing over the creek near the mouth of **Alviso Slough.** A small channel is marked from the railroad bridge to the mouth of **Mayfield Slough** which is southward of the **Palo Alto Airport.** A yacht club is located near the mouth of Mayfield Slough.

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†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

*Lat. 37°30′.0, Long. 122°08′.5: Charts 5402, 5531.

South Shore Port, formerly **Jagels Landing,** on Jagel Slough, has a small amount of domestic trade which consists of fruit, farm products, and general merchandise. The channel to South Shore Port is feasible for scows and light-draft vessels at high tide. The bar bares at low water.

Alviso is located at the headwaters of Alviso Slough. There is little water traffic here, and only by scows and light-draft vessels. The trade is similar to that of South Shore Port.

On the eastern side of the bay from Dumbarton Point, to the **Oakland Municipal Airport** on **Bay Farm Island,** about 12 miles, the low waterline extends from 0.5 to 1 mile offshore. **Coyote Hill Slough, Alameda Creek,** and **Mount Eden Slough** enter the bay on this side.

ALAMEDA AND OAKLAND

(CHART 5535)

Alameda and Oakland are two cities on the eastern shore of the bay opposite San Francisco.

Alameda is on an island separated from the mainland by **San Leandro Bay** on the east, and Oakland Harbor and Tidal Canal on the north. A railroad mole and wharf, parallel to Oakland Harbor, projects about 2 miles westward of the western part of the town and form a part of the southern jetty of the estuary.

The **Naval Air Station** is near the outer end of the **Alameda Mole.** The **San Francisco Bay Airdrome** is located about 1.5 miles eastward of the Naval Air Station.

Restricted Area.—There is a restricted area southward of the Naval Air Station where no vessel may enter without prior approval of the naval authorities. The area is outlined on the charts.

Aero beacons.—There are aero beacons at the Naval Air Station, the San Francisco Bay Airdrome, and the Oakland Airport. High up in the hills 8 miles eastward of the entrance to the Oakland Harbor is another aero beacon that may be seen from the bay.

Oakland is situated on the eastern or mainland shore opposite San Francisco, and is the second largest city on San Francisco Bay. It is the physical terminus of the various transcontinental railroads entering the San Francisco Bay area.

The **Port of Oakland** is under the jurisdiction of the Board of Port Commissioners of the city of Oakland and is entirely distinct from the Port of San Francisco. Oakland is a separate United States Customs Port of Entry and there is an appraiser's store in the city.

Oakland Harbor, which is located adjacent to the most highly developed section of Oakland, is an estuary 9 miles long. It is bordered on the north by Oakland and on the south by Alameda. At the eastern end is an artificial **Tidal Canal** leading to San Leandro Bay and thence to the Oakland Municipal Airport by a channel.

Channels.—In April 1942, the controlling depth across the shoal southeast of Yerba Buena Island, at the entrance to the estuary, was 28 feet; thence through Oakland Harbor entrance 27 feet; thence to the east end of **Government Island,** 30 feet; thence 26 feet along the south side of Government Island; thence 27 feet to the Tidal Canal; in the **Brooklyn Basin** at the west end for 1,200 feet was 28 feet; thence 18½ feet to the Dennison Street Bridge. In April 1941 the controlling depth in the Tidal Canal was

18 feet; thence 7 feet across San Leandro Bay; thence 24 feet in the upper section of the channel to the Oakland Municipal Airport.

†In _____ 19___, the controlling depths in the channels were:_____

_____

_____

_____

Bridges.—There are three bridges over the Tidal Canal, one over San Leandro Bay, and a fixed bridge over the east end of Brooklyn Basin. The bridges over the Tidal Canal have the following dimensions: Park Street, double leaf bascule, horizontal clearance 240 feet, vertical clearance 15 feet at MHW for a 100-foot channel; Fruitvale Avenue, swing span, horizontal clearances 58.5 feet on the northern side and 64 feet on the southern side, vertical clearance 6.7 feet at MHW; High Street, bascule, horizontal clearance 240 feet, vertical clearance 16 feet at MHW. The Bay Farm Island Bridge is a swing bridge with a horizontal clearance of 83.3 feet and a vertical clearance of 5.2 feet at MHW. The signal for all of these bridges is 3 long blasts.

Closed Periods.—Fruitvale Avenue Bridge (a) Except on national holidays and as provided in subparagraph (b) below, the draw of this bridge shall not be required to open for the passage of vessels, other than police or fire boats and vessels employed or controlled by the United States, during the following periods:

Monday to Friday inclusive:
Between 6:50 a.m. and 8:30 a.m. and
Between 5:00 p.m. and 6:30 p.m.
Saturdays,
Between 6:50 a.m. and 8:30 a.m. and
Between 12:30 p.m. and 2:00 p.m.

(b) Between the hours of 12:30 p.m. and 2:00 p.m. on Saturdays the draw shall be opened for vessels that are prepared to pass promptly through the bridge and give the required signal during the following periods:

12:42 to 12:47	1:22 to 1:27 and
1:02 to 1:07	1:42 to 1:47

Bay Farm Island Bridge: (a) Between the hours of 9:00 p. m. and 5:00 a. m. throughout the year the drawbridge across San Leandro Bay between Alameda and Bay Farm Island, owned and operated by the Board of Supervisors of Alameda County need not be opened for the passage of watercraft.

(b) A copy of these regulations shall be conspicuously posted on both the upstream and downstream sides of the bridge in a manner so that it can be easily read at any time.

The **Naval Supply Depot** lies immediately northward of the harbor entrance between the Southern Pacific and Western Pacific Moles, on which are located three freight piers. A channel with a least depth of 35 feet is being dredged through the flats to the piers. In April 1941 the controlling depth in the channel was 28 feet. † In _____ 19____, the controlling depth in the channel was: _____. Adjacent to the Naval Supply Depot on the north is the terminus of the Southern Pacific Railroad, which is used largely for passenger ferry service.

The **Outer Harbor** lies between the Southern Pacific Mole on the south and the Key Route Pier on the north. This is the site of several large terminals and a shipyard.

A channel bearing 56° has been dredged across the shoal off Oakland Mole to Oakland Outer Harbor. In April 1941, this channel had a controlling depth of 27½ feet. The channel is marked by two side ranges, both lighted, and by buoys. The channel off the pierhead line to the northern end, in the vicinity of the Outer Harbor, had a controlling depth of 35 feet. †In _____ 19____, the controlling depth in the channel was: _____.

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

Shipyards.—The Port of Oakland contains seven shipbuilding and repair yards with marine railways and floating drydocks. The largest has a length of 701 feet, width of 90 feet, 30 feet on the blocks, and a lifting capacity of 21,000 tons.

Emeryville is a small manufacturing town on the bay shore northward of Oakland. Several small wharves, accessible for light-draft vessels at high tide, are built out in this vicinity.

Berkeley is the seat of the University of California. It is a rapidly growing city northward of and adjoining Oakland. There is a long pier extending into the bay. In clear weather, the **Campanile** (bell tower) at the University of California shows prominently from the bay.

NORTHEASTERN SHORE OF SAN FRANCISCO BAY

(CHART 5532)

Berkeley Yacht Harbor on the northern side of the long pier is enclosed by breakwaters, the two sides of the entrance being marked by lights. A fog bell is also located on the breakwater on the southern side of the entrance. Gasoline and oil may be secured at the city wharf which has sufficient depth alongside for the deepest draft using the harbor. The harbor master's office is located on the city wharf. There is a boat repair shop and marine railway on the southeastern corner of the basin. A draft of 7 feet could be carried through the entrance channel of the yacht basin in December 1938.

Southampton Shoal extends in a northwesterly and southeasterly direction for about 2 miles, with an average width between the 18-foot curves of 0.25 mile. The least water on the shoal in 1940 was 15 feet. The channel eastward of the shoal has depth of 20 feet, and is little used, except by vessels bound for the wharves between Point Richmond and Point San Pablo.

Southampton Shoal Light,* shown from a white square frame building on piers, marks the southern end of the shoal. The light is 52 feet above water, and visible 12 miles. A fog signal is sounded on an air diaphone.

The deep water channel between Red Rock Bank and the northerly extremity of Southampton Shoal is marked by lighted buoys.

Red Rock, 169 feet high, in the northern part of the bay, is visible in clear weather from the anchorage near Yerba Buena Island. It is reddish in color and of small extent. It lies about a mile from the eastern shore and 2.3 miles southward of Point San Pablo.

Red Rock fog signal is located on an iron stand just south of the rock. It is maintained from October 1 to March 31 each year.

A shoal, with depths of 22 to 30 feet, extends about 1.3 miles southward of Red Rock. The bottom rises gradually toward the shoal; the usual course of vessels leads westward of the 30-foot curve surrounding it. A lighted buoy marks a 28-foot spot near the western edge of the shoal and a lighted bell buoy is moored on its southeastern point in 30 feet of water.

The channel eastward of Red Rock and The Brothers is frequently used by river steamers on the ebb, as the current has less velocity, although the rips and swirls are heavy at times.

Point Richmond (Richmond Harbor), on the eastern shore of the bay, nearly 4 miles southward of Point San Pablo, is the terminus of the Santa Fe Railroad, and an important oil-refining center.

*Lat. 37°52′.9, Long. 122°24′.0: Chart 5532.

The inner harbor has been improved by dredging a channel from deep water off Point Richmond toward **Shoal Point,** thence northward to Ellis Landing and Municipal Wharf No. 2. In May, 1942, the controlling depths were: Entrance Channel, 29 feet to the turn; thence 24½ feet to **Municipal Wharf No. 1;** thence 20 feet to Shoal Point; thence 27 feet to **Santa Fe Channel;** thence 29 feet to the head of the channel. †In _____, 19___, the controlling depths in the channel were: _____ _____ _____.

There is a training wall 10,000 feet long extending westward from **Brooks Island** with a light and fog horn on the outer end. The railway-car ferry slips are built out from Point Richmond just northward of the dredged channel. An echo board has been established on the southeastern side of the sharp bend in the channel off Shoal Point. The oil tanks on the hill back of Shoal Point are prominent. Many deep-draft vessels now make Richmond Harbor a regular port of call.

Midway between Shoal Point and Point San Pablo, there are a large number of oil tanks. This area as far northward as Point San Pablo is part of Richmond Harbor. It is an important oil shipping point, and many large vessels load petroleum products from the wharf 1.25 miles north of Point Richmond and from the wharf at **Point Orient.** The ferry slip for the San Rafael Ferry is 0.3 mile southward of Castro Point. There is a private wharf, partially in ruins, at **Winehaven,** just northward of **Molate Point.** The wharf at Point San Pablo is used by large vessels for general cargo and petroleum products.

Castro Rocks are small and low, and lie 0.3 mile off **Castro Point,** on the eastern shore abreast Red Rock. The southwestern edge of the surrounding shoal is marked by a lighted buoy. Vessels should not pass eastward of this buoy.

Invincible Rock, with 7 feet over it, lies 0.5 mile 216° from East Brother Island Light, and is marked on its southwestern side by a lighted buoy. **Whiting Rock** with 13 feet over it, lies northward of Invincible Rock, and nearly 0.4 mile 229° from East Brother Light. It is marked off its southern side by a buoy.

The Brothers are two small, low, flat-topped islands 0.3 mile westward of Point San Pablo. The eastern one is surmounted by a light and fog signal. The light is 61 feet above water, shown from a square white tower on dwelling, and visible 13 miles. The fog signal is a two-tone air diaphone.

Point San Pablo is the northwestern extremity of a low ridge of hills on the eastern shore of the bay at its junction with San Pablo Bay. The point rises abruptly to a height of 140 feet. A railway wharf with a warehouse upon it is built southward from the point, parallel with the channel. There are several oil tanks just to the southward of Point San Pablo.

For San Pablo Bay and northward see page 138.

NORTHWESTERN SHORE OF SAN FRANCISCO BAY

(CHART 5532)

Lime Point is described on page 118. Horseshoe Bay, Point Cavallo, and Yellow Bluff are described on page 124.

Sausalito, on the western shore about 2 miles northward of Lime Point, is the terminus of a railroad extending northward to Humboldt Bay. The anchorage off Sausalito is much used by yachts and small pleasure craft.

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

Richardson Bay, northward of Sausalito, is shoal and of little importance commercially. Several hulks are grounded in the bay. The upper end of the bay is crossed by a highway bridge with a vertical lift span; horizontal clearance 40 feet, vertical clearance 27 feet when closed, 57 feet when open.

Belvedere, on the eastern shore of Richardson Bay opposite Sausalito, is a summer resort and of little commercial importance.

Tiburon, near **Point Tiburon,** is the terminus of a railroad connecting with interior points to the northward.

Angel Island, partially wooded, is about 1.5 miles northward of Alcatraz Island, and is separated from the mainland by Raccoon Strait on its northern side. The island is irregular in shape, its greatest length being about 1.3 miles in an easterly direction with a width of over a mile. The highest point, 782 feet, is in about the center of the island.

Point Knox,* the southwestern point of Angel Island, is marked by a light and fog signal. **Angel Island Light,** on Point Knox, shown from a white square dwelling, is 50 feet above water, visible 12 miles. The fog signal is sounded on a bell. A shoal, with 16 feet at its outer end and marked by a lighted buoy, extends 400 yards southward of Point Knox. A wharf for the military post is situated in the bight about 0.25 mile northwestward of the point.

Point Knox Shoal, westward of Point Stuart, has a least depth of 35 feet.

Point Blunt, the southeastern extremity of Angel Island, terminates in a knob 60 feet high, and is connected with the island by a low neck of land. A shoal with visible and sunken rocks upon it extends southeastward for about 0.1 mile. The tide rips and swirls are heavy around Point Blunt, especially on the ebb of a large tide. **Point Blunt Light,** shown from a white house, is 60 feet above the water, visible 13 miles. A fog signal is sounded on an air diaphragm horn.

Quarry Point, the eastern extremity of the island, is a bold bluff, with deep water close-to. A wharf is built out from this point for the United States detention camp which is located abreast of the point. Just northward of **Point Simpton,** the northeastern point of the island, are the wharf and buildings of the United States immigration station which were partly destroyed by fire. A light and an electric fog bell are on the end of the wharf.

Hospital Cove is a small bight on the northern shore of Angel Island. The wharf for the national quarantine station is on the eastern shore of the cove.

Point Stuart, the westerly point of Angel Island, has a light and a fog signal. The **Point Stuart Light,** shown from a white frame house, is 80 feet above water. The fog signal is sounded on an air diaphragm horn.

Raccoon Strait, on the northwestern side of Angel Island, is nearly 0.5 mile wide, and is sometimes used by vessels bound northward in San Francisco Bay from Lime Point. The strait is free of dangers, but the tidal currents have considerable velocity and the rips and swirls are heavy at times. A mid-channel course can be followed with safety.

Caution.—In navigating Raccoon Strait with a deep-draft vessel care should be taken to avoid Raccoon Shoal, least depth 28 feet, 600 yards northward of Stuart Point Light. It is proposed to dredge this shoal to a depth of 35 feet.

California City is situated about 0.5 mile northward of Bluff Point.

Point San Quentin, on the western shore, about 3 miles southward of Point San

*Lat. 37°51′.4, Long. 122°26′.5: Charts 5402, 5502, 5532, 5535.

Pedro, is prominent on account of the low land on either side. The buildings of the State Prison, and the wharf built out from the eastern extremity of the point, are prominent. The long wharf is marked by lights placed both on the northern and southern ends of the loading face. A fog bell is also sounded at the northern end; just south of the wharf is a vehicular ferry slip with a long approach.

Corte Madera Creek is at the head of the bight southward of Point San Quentin. Two drawbridges cross the creek about 0.7 mile from its mouth.

The Marin Islands, about 1.3 miles northward of Point San Quentin in **San Rafael Bay,** are two small islands lying close together about 1 mile offshore. There is shoal water around them and all the way inshore. There are several houses on the northern side of the eastern island.

San Rafael is located about 3 miles westward of Marin Islands. A channel marked by an entrance light, three additional post lights, and a lighted range, has been dredged through the flats to the mouth of **San Rafael Creek,** and the creek has been improved to the city. The entrance light is 26 feet above water, and is shown from a white framework on a black 4 pile structure. A fog signal, bell, is maintained from October 1 to March 1. The range lights have white triangular daymarks; the vertex is up on the front range and down on the rear range. In June 1941, the controlling depth was 4 feet across the flats and at the mouth of the creek. In June 1942 the controlling depth was 5½ feet in the creek to the head of navigation in San Rafael. †In _____ 19__, the controlling depths in the channel were: _____

Point San Pedro, at the western entrance to San Pablo Bay, extends about 100 yards eastward of **San Pedro Hill,** 356 feet high. There is a large quarry just northward of the point.

DIRECTIONS, NORTHERN SECTION OF SAN FRANCISCO BAY

If bound for San Pablo Bay (Chart 5532).—From the center of the Golden Gate Bridge steer **063°** for about 3.45 miles, giving Point Blunt a berth of 0.5 mile. Round Point Blunt at this distance and steer **335°** for 4.3 miles heading just westward of the western one of the Marin Islands, passing 0.25 mile northeastward of Quarry Point and Point Simpton (Angel Island), and 250 yards southwestward of Red Rock Bank lighted buoy, to a position with Red Rock abeam, distant 1.0 mile. Then steer **005°** for 2.55 miles heading for the western one of The Sisters, off Point San Pedro, and passing westward of Invincible Rock and Whiting Rock buoys to East Brother Island Light bearing 95°, distant 0.6 mile. Change to Chart 5533.

From this position steer **037°** for 3.4 miles to the lighted bell buoy at the southwestern end of the dredged channel. The courses through the dredged channel are **049°** for 1.95 miles, then **058°** for 2.3 miles, then **078°** for 2.2 miles to the two lighted buoys at the eastern end. The northern buoy has a bell.

The following regulations governing the use, administration, and navigation of Pinole Shoal Channel have been prescribed by the Secretary of War:

Regulations Pinole Shoal Channel.—(a) The use of Pinole Shoal Channel is restricted to navigation of vessels of greater draft than 20 feet, or by towboats with tows drawing more than 20 feet. Vessels operated by either sail or power, and tows drawing less than 20 feet, are not permitted to use this channel, nor to cross it between buoy No. 3, marking the western end of the channel, and buoy No. 11, marking its eastern end.

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

(b) Vessels permitted to use Pinole Shoal Channel under paragraph (a) must proceed through the channel at a reasonable speed such as not to endanger other vessels and not to interfere with any work which may become necessary in maintaining, surveying, or buoying the channel, and they must not anchor in the channel, except in cases of emergency, such as fog or accident, which would render progress unsafe or impossible.

(c) These regulations are not to be construed as prohibiting any necessary use of the channel by any Government boats while on Government duty, nor in emergencies by pilot boats, whether steam or sail, nor by police boats, nor by the vessels of passenger steamship lines, operated on regular schedules.

If bound to Mare Island Navy Yard (Chart 5525).—From the position at the eastern end of Pinole Shoal Channel, steer **074°** for 1.65 miles to a position 0.3 mile south-southwestward of the entrance to the strait with a black buoy 0.15 mile on the port beam and Carquinez Strait Light bearing 57°, distant 0.45 mile. Then steer **043°** for 0.3 mile to a position midway between the ends of the jetties and then follow the channel. From this point on, local knowledge is required to take advantage of the best depths as the straits are subject to frequent shoaling.

Notice.—Ships destined for Navy Yard, Mare Island, should await arrival of a Navy Yard pilot at Carquinez Strait.

Prohibited area.—No vessels except those with proper federal authorization shall enter the area within one hundred yards of the shore of Mare Island, from the Mare Island-Vallejo Causeway around the southern end of the island, thence to the northwestern limit of the Navy Yard; nor shall vessels approach within 50 yards of the two berthing piers.

If bound to Carquinez Strait (Chart 5533).—From a position between the two lighted buoys at the eastern end of Pinole Shoal dredged channel, steer **086°** for 2.8 miles, passing 150 yards northward of the center pier of the Highway Bridge. Change to Chart 5534. Then steer **104°** on a mid-channel course for 2.05 miles passing 300 yards northward of Carquinez Strait Light No. 2 and continuing 0.5 mile beyond it to a position with Port Costa Light bearing 178°. Then steer **140°** for 1.6 miles, passing 300 yards to the northward of Port Costa Light, to a position 300 yards southward of Benicia Shoal light buoy No. 1A, with the center of the lift span of the railroad bridge bearing 83°. Then steer **090°**, heading for the chimmey on Bulls Head, for a distance of 1.5 miles. When abeam of westerly (of two) oil wharf and distant about 300 yards, steer for the lift span of the Southern Pacific Railroad bridge on course **062°**.

If bound to Suisun Bay and San Joaquin River (Chart 5534).—From the Southern Pacific Railroad bridge steer **062°** for 1.3 miles to the lighted buoy off Avon oil wharf. Then steer **073°** for 0.7 mile, passing midway between the buoy and the wharf. Then steer **057°** on the lighted range (both daymarks are black triangles with white vertical stripe on pile structure) for 1.1 miles through Point Edith dredged cut to a position 100 yards southwestward of lighted buoy on the north side of the channel and Point Edith Light bearing 219°. Then steer for Roe Island Light on the right tangent of the island on course **078°** for 0.95 mile, passing 100 yards southward of Point Edith Crossing Front Range Light. When abeam of the lighted horn buoy off Roe Island, 100 yards to northward, round slowly into dredged cut opposite Bay Point on course **104°**, with Point Edith Crossing Rear Range Light astern, for about 1.0 mile to a position with Bay Point Light bearing 180°, distant 400 yards. Change course to **100°** for 1.4 miles to a position 100 yards southward of Middle Ground lighted buoy, where Middle Point Light will bear 180°. Then steer **076°** for 0.6 mile to a position midway between Middle Ground Light, bearing 346° and the lighted buoy marking the south side of the channel. Alter course to **098°** for 0.7 mile to a position 100 yards northward of the

lighted buoy on the southern side of the channel. Then steer **110°** for 2.3 miles, passing 250 yards northward of Stake Point Light and 200 yards northward of Mallard Island car ferry slip.

From the slip steer **087°** for 1.3 miles to a position 200 yards northward of the New York Slough Entrance lighted bell buoy at the western entrance to New York Slough. Round this buoy at a distance of 200 yards and head for the right tangent of Browns Island on course **127°**. Round New York Slough West End Light on New York Point within 100 yards and steer various courses to pass the same distance off the wharves at Pittsburg. Pass 75 yards northward of the large lumber wharf 0.5 mile eastward of Pittsburg. Then steer **090°** for 0.6 mile, passing within 75 yards of Browns Island Light. Then steer **122°** for 0.5 mile passing within 75 yards of Pittsburg Landing Light and parallel to the southern shore until abeam of a wharf. Then steer **087°** through dredged cut into San Joaquin River, passing 100 yards northward of San Joaquin River lighted buoy. This course passes 375 yards southward of New York Slough East End Light on **Point Beenar.**

SAN PABLO BAY

(CHART 5533)

San Pablo Bay is a nearly circular basin of water about 10 miles long in a northeasterly direction, with a greatest width of about 8 miles. The northern part consists of low marshes intersected by numerous sloughs with a large area of shoal water and mud flats that bare at extreme low tides. The southern shore is bolder, except between Point San Pablo and Pinole Point,* where it is low and marshy for about 3 miles. At its eastern extremity it communicates with Suisun Bay by Carquinez Strait, and by Mare Island Strait northward with Napa River. There is considerable traffic through the bay. Deep-water vessels pass through to load grain at points on Carquinez Strait, and to South Vallejo to load flour and discharge lumber, while many oil tankers and sugar-laden vessels pass through the bay bound for Crockett and Martinez, and up the San Joaquin River to Stockton. Light-draft vessels pass through for points on Suisun Bay and the Sacramento and San Joaquin Rivers, and on Petaluma Creek.

Point San Pablo is described on page 134. Point San Pedro is described on page 113.

There are several landings on the southern shore of San Pablo Bay used by light-draft vessels. **McNear,** on the northern shore near Point San Pedro, is the most important.

The main channel through the bay extends in a gentle curve northward and eastward from the entrance to the eastern end of the bay. The average width between the 18-foot curves is a little over 1.3 miles, being a little wider at the southern end and about 0.8 mile wide at the eastern end. **Pinole Shoal Channel** has been improved by dredging; in 1940, the controlling depth was 35 feet in the western section and in July 1942, the controlling depth in the center and eastern sections was 28½ feet. †In _____ 19 ____, the controlling depth in the channel was _____. The dredged channel is marked by lighted buoys at intermediate points and lighted bell buoys at each end.

Regulations, Pinole Shoal Dredged Channel. See page 136.

Pinole Point is a moderately high, rocky bluff projecting about a mile from the southeastern shore of San Pablo Bay, and there is a wharf built out from the eastern

*Lat. 38°00′.8, Long. 122°21′.8: Charts 5402, 5502, 5533.

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

side. Powder works are located on the point, and about 2 miles back of it there are numerous oil tanks, and the area is referred to as a "tank farm."

Shoals and flats, bare at low water, extend from Point San Pablo to Pinole Point, and from Pinole Point northeastward to **Lonetree Point.**

Oleum, on **Davis Point,** is a small oil town. There is a wharf built out to deep water and oil tankers call frequently. The many oil tanks on the hills back of the town are prominent.

Selby is a smelting town about a mile eastward of Oleum. The smelter is distinguished by a concrete stack about 630 feet high, claimed to be the tallest in the world.

Landmarks.—The highway bridge, fixed span, and the pyramidal skeleton towers that carry electric power cables across Carquinez Strait, are prominent. The cables have a clearance of 200 feet at MHW.

Mare Island Strait (**Chart 5525**), at the mouth of the Napa River, lies between the mainland and **Mare Island.** South Vallejo and Vallejo are situated on the eastern side of the strait and the Navy Yard on the western side, about 2 miles above the southern entrance. A channel about 30 feet deep and 600 feet wide, widened to 1,000 feet abreast the Navy Yard, has been dredged from the entrance to the Navy Yard. It is subject to shoaling and is redredged at intervals. In September 1942, a survey showed a controlling depth of 30 feet to within one-half mile of the Mare Island-Vallejo Causeway, except for two small shoals of 29 feet near the entrance. †In _____ 19____, the controlling depth in the channel was _____

_____.

Mare Island Strait is well marked by lighted beacons and buoys. The channel is contracted by jetties on each side at the entrance and in several places above the entrance.

Notice.—Ships destined for Navy Yard, Mare Island, should await arrival of a Navy Yard pilot at Carquinez Strait.

For prohibited area see page 137.

Carquinez Strait Light* is shown from a cream-colored tower on dwelling located on the jetty on the eastern side of the entrance to Mare Island Strait, 230 yards from its end. A lighted beacon and fog signal are located on the end of the jetty.

Carquinez Strait is described on page 141.

South Vallejo, on the eastern shore of Mare Island Strait, inside the entrance, is the terminal of a railroad connecting with interior northern points. A large flour mill is located southward of the railroad wharf, and lumber wharves to northward are prominent in entering. The flour mill wharf has 30 feet alongside and 28 feet can be carried from the entrance to this point with local knowledge. From 10 to 21 feet can be taken alongside the other wharves, depending on the locality. Communication may be had by rail and steamers with other points on the bay; there are telegraph and telephone facilities.

Vallejo, about 1 mile above South Vallejo, is of little commercial importance. It supplies a large amount of fresh provisions to the naval station and affords residences for the employees and others attached to the station. It also serves as a distributing point for a considerable agricultural area in its vicinity. Communication with San Francisco and other points may be had by rail, bus, and steamer; a ferry makes regular trips to the navy yard. There is a regular barge and towboat freight service to **Napa** at the head of navigation on Napa River. The United States naval station, located on

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

*Lat. 38°04′.2, Long. 122°14′.5: Charts 5502, 5525, 5533, 5534.

the western side of Mare Island Strait, has two dry docks and extensive facilities for repairing and building vessels of all sizes.

The Vallejo-Mare Island Causeway, with a draw span, connects Mare Island with the city of Vallejo at the northern end of the navy yard. The clear width of opening is 73 feet and the vertical clearance when closed is 5.5 feet at MHW. At **Sears Point,** 1 mile above Vallejo, is a highway bridge with a bascule span, with 75 feet horizontal clearance and a vertical clearance of 11.5 feet at MHW when closed. The spans remain closed to navigation from 7:00 a. m. to 8:00 a. m. and from 4:00 p. m. to 5:00 p. m. daily.

Napa River, the continuation of Mare Island Strait above the navy yard, has been improved by dredging, and in 1941 there was a least depth of 8 feet to Napa, 17 miles from the entrance to Mare Island Strait. †In_____, 19___, the controlling depth in the channel was:_____. The mean tidal range is about 5 feet, and the river channel is subject to some shoaling. The channel is marked by lighted beacons and buoys. A considerable amount of farm and dairy produce is carried in vessels of 4 to 6 feet draft to and from various points on the river. Petroleum products, principally gasoline, are shipped to Napa in large quantities, from which point it is distributed.

The Napa River is crossed by a railroad swing bridge about 8.5 miles above Vallejo, with a horizontal clearance of 75 feet and a vertical clearance of 11 feet above MHW when closed; and 2 fixed bridges in Napa with minimum clear width of 47.2 feet, and 10.2 feet vertical clearance at MHW.

Dutton Landing is on the eastern side of Napa River about 75 yards below the railroad bridge. It is reported much frequented by local boats.

Petaluma Creek enters San Pablo Bay at its western end. It is improved by a channel and turning basin with a project depth of 8 feet to the city of **Petaluma,** which is the center of an extensive poultry and egg industry. Large quantities of feed and petroleum products are shipped in, and fruit, poultry, and eggs are shipped out. In June 1942, the controlling depth in the improved channel across the flats at the entrance to Petaluma Creek was 8 feet to the turn southward of **Midshipman Point,** thence 6 feet in the remainder of the channel. In June 1940, the controlling depth was 7 feet to **McNear Canal;** and in April 1941, the controlling depth was 4 feet in the upper end of the turning basin. †In _____, 19___, the controlling depths in the channel were:_____

_____

A lighted buoy and an echo board have been established near the entrance to the channel across the flats. This channel is marked by lighted beacons, and above the entrance the chart is the guide. The creek is crossed by a railroad drawbridge near its mouth and by a railroad and two highway bridges in Petaluma. The controlling clear width of these bridges is 47 feet and the least clearance at MHW when closed is 4 feet.

A 3½-foot channel, through the flats off **Pacheco Point** leads to **Hamilton Field.** The channel lies southward of a line of lights and beacons. There is a tall black and yellow tank a little to the northward of the channel.

Anchorage Grounds for San Pablo Bay, Carquinez Strait, and Suisun Bay, and rules and regulations pertaining thereto are set forth in a publication of the War Department. The officer of the Coast Guard, designated as Captain of the Port with offices in the Customhouse, San Francisco, is charged with the enforcement of the regulations.

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

The limits of the anchorages are shown on charts 5533 and 5534.

Currents.—When the land water discharge is small, the time of the currents in San Pablo Bay, off Mare Island, and in Suisun Bay, follow the times of the currents in the Golden Gate by approximately 1, 2, and 3 hours respectively.

Directions through San Pablo Bay and Mare Island Strait to the navy yard are given on page 136.

CARQUINEZ STRAIT

(CHART 5534)

Carquinez Strait connects San Pablo and Suisun Bays and is about 6 miles in length in a general easterly direction. For the first 3.5 miles it is a little less than 0.5 mile in width, and then expands to a width of about a mile. It is deep throughout with the exception of a small stretch of flats on the northern shore, and a smaller area in the bight on the southern shore near the eastern end. There are several small settlements on both shores.

A highway bridge crosses the strait at **Semple Point.** It is a cantilever bridge with one pier located in the middle of the strait. Two fog signals, a bell on the northern side of the center pier, and an air diaphone on the southern side of the center pier have been established. There is a bell on the northern pier and an aero beacon on top of the center pier. The northern span has a horizontal clearance of 1,037 feet and a vertical clearance of 141 feet above MHW; the southern span has a horizontal clearance of 1,032 feet and a vertical of 151 feet above MHW.

Crockett, on the southern shore, is built around a large sugar refinery. The wharves accommodate the deep-draft vessels that discharge sugar from the Hawaiian Islands.

There is an overhead cable-crossing between Vallejo Junction and Semple Point with a vertical clearance of 200 feet above MHW and another overhead cable-crossing between **Eckley,** on the southern side of the strait about 0.6 mile eastward of Crockett, and **Dillon Point** on the northern side, with a vertical clearance of 206 feet above MHW.

Port Costa, on the southern shore, ships a large amount of wheat. Extensive warehouses for storing the grain occupy a considerable portion of the southern shore of the strait. There is a light and a fog bell at Port Costa and a light at the northwestern extremity of the wharves, about 0.7 mile from the light.

An oil wharf with deep water alongside is located on **Point Carquinez,** about 0.5 mile southeastward of Port Costa. Several large oil tanks are situated on top of the hill above the wharf. There is a brickyard with a wharf for lighters and small craft about 0.2 mile above the oil wharf.

A shoal spot, with a least depth of 12 feet, lies 600 yards 176° from the Benicia City Wharf Light. It is marked by a lighted bell buoy.

Benicia is situated on the northern point at the eastern entrance. The United States Army reservation and arsenal are located at the eastern end of the town. A railroad lift bridge has been constructed from **Army Point** to **Suisun Point.** Three fog signals have been established; two are on Pier 13, and the other is on Pier 17. The horizontal clearance is 291 feet and the vertical clearances are, closed 70 feet, open 135 feet above MHW.

Ferry.—An automobile ferry operates between Benicia and Martinez.

Martinez, on the southern shore, in the bight near the eastern entrance, is a town of some commercial importance. There are two wharves off the town. The shorter and

westernmost pier is not used at present. The longer pier is used by light-draft vessels, fishermen, and yachts, and has a ferry slip built on the western side at about its midpoint. In 1938 there was 23 feet at the end of the pier. There is a small yacht harbor on the eastern side of this pier with about 6 feet of water. It is protected in most weather. A **harbor master,** whose office is on the pier, assigns berths to yachts. Just to the eastward of the town are two piers built out to deep water, and used for handling oil. In 1938 there was 35 feet at the end of the westerly T-shaped pier and 30 feet at the end of the easterly pier. Both piers are lighted and each has a fog signal.

Bulls Head Point* shows as a rounding hill, and is 100 feet high. The high brick stack located on the point is prominent. There is an oil refining plant here with many storage tanks located between it and Martinez.

SUISUN BAY

(CHART 5534)

Suisun Bay is a broad, shallow body of water with marshy shores, and filled with numerous marshy islands, a large number of which have been reclaimed and are now under cultivation. It is practically the delta of the Sacramento and San Joaquin Rivers, which empty in the eastern part of the bay. Two narrow, winding channels, northern and southern, lead to the mouths of the rivers. They are well marked by buoys and beacons and several lights. The rivers and the channels near their mouths have been improved by the Government with a view of increasing the depth, removing obstructions and providing relief during seasons of freshet. In January 1941, the controlling depth in the main channel in the bay was 30 feet. The controlling depth in the channel southward of **Seal Islands** was 18 feet. The main channel has been dredged to 30 feet all the way to Stockton. †In _____ 19 ____, the controlling depths in the channels were: _____

_____

_____

The bay is used by many light-draft vessels, which possess the local knowledge necessary for its navigation. Strangers should take a pilot if bound above Benicia.

Suisun Slough, emptying into the northwestern side of Suisun Bay about 5.5 miles northward of Benicia, has been improved by dredging, and in June 1941 there was a least depth of 8 feet to the head of navigation at **Suisun City,** about 15 miles above the entrance. The range of tide is about 5 feet. Fuel oil is carried by vessels of not over 6-foot draft, and rock for building purposes is barged out.

Northward of the main channel are two shallow bays, several islands, and many sloughs. **Grizzly Island** is separated from the mainland by **Montezuma Slough. Grizzly Bay,** very shallow, cuts into the island on the southwestern side. **Honker Bay** is just northward of the channel and is bounded on the north and east by **Dutton, Wheeler,** and **Chipps Islands. Spoonbill Creek** separates **Chipps Island** from **Van Sickle Island.** Entrance to Grizzly Bay from the eastward is by **Suisun Cutoff** which passes westward of **Snag, Freeman,** and **Simmons Islands,** and eastward of **Ryer Island. Roe Island** is northward of the channel opposite **Bay Point. Roe Island Light,** on the southern point, is shown from a white square house on piles. The light is 41 feet above water.

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*Lat. 38°02′.2, Long. 122°07′.0: Chart 5534.

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

At **Avon,** about 1.5 miles eastward of Bulls Head Point, an oil wharf has been built across the flats to the deep water of the channel to accommodate large oil tankers. The wharf is marked by two lights and a fog bell.

Sealbluff Landing, 4 miles eastward of Bulls Head Point, is the site of a shipyard which has not operated for several years. The lumber wharf 0.5 mile eastward of Sealbluff Landing is still standing, but the mill has burned down. A small yacht harbor has been dredged into the town of **Port Chicago.** There is an airway beacon on the hill about a mile southeastward of the town of Port Chicago.

The San Francisco and Sacramento Railroad maintains a car ferry between **Mallard Island** and Chipps Island. There is a ferry slip on each side of the channel; each is marked by two lights and a fog bell.

Pittsburg is a steel-manufacturing town situated at the mouth of **New York Slough.** It has rail connections and a small amount of water-borne commerce and is the center of a considerable fishing industry. There is a large lumber wharf 0.5 mile eastward of the town with 18 feet alongside.

Antioch (Chart 5527), about 5 miles eastward of Pittsburg, is a manufacturing city with but little water-borne commerce. The water of the San Joaquin River is fresh at this point and is used as the city water supply. During parts of the year, and especially in dry years, it becomes brackish.

SAN JOAQUIN RIVER

(CHART 5527)

The **San Joaquin River,** entering the eastern side of Suisun Bay on the southern side of **Sherman Island,** is a winding stream navigable for deep-draft vessels to Stockton. Cut-off channels have been dredged to eliminate the sharper turns. The area through which the river flows is reclaimed tule marsh. Bordering the various waterways are levees which are about 12 feet higher than the land behind them and for the most part have dirt roads on the top. Tule is often found growing on the channel side of the levees.

The present project for the San Joaquin River provides for a channel 30 feet deep from New York Slough to Mormon Slough at Stockton. In June 1941, the controlling depths were: 22 feet to Mormon Slough; thence 25 feet to Edison Street; thence 9 feet to head of navigation at El Dorado Street. †In _____ 19 ____, the controlling depths in the channel were: _____

_____.

The channel is well marked between Antioch and Stockton.

There are two overhead cable crossings over the main channel about 2 miles eastward of Antioch. The vertical clearance is 140 feet at MHW. The Antioch Bridge, 0.65 mile eastward of the eastern end of **West Island,** has a lift span with a horizontal clearance of 265 feet and vertical clearances above MHW of 70 feet when lowered and 135 feet when raised.

There are four overhead cable crossings over the San Joaquin River below Stockton and the minimum vertical clearance is 135 feet.

From the span of the Antioch Bridge the channel crosses to the eastern side, passing close to **Blind Point** and **Jersey Point.** **False River** enters about 0.6 mile northeastward of Jersey Point. The channel follows the **Bradford Island** shore to the turn where it

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

swings northward along the **Twitchell Island** shore, and then swings back to Bradford Island, with **Santa Clara Shoal** between the channel and Twitchell Island. After passing the mouth of **Fishermans Cut,** it swings northward close to **Oulton Point,** again skirting the point of Twitchell Island to the mouth of **Sevenmile Slough** and then turns southerly between the tule banks and **San Andreas Shoal.** Thence the channel turns sharply southward at **Webb Point** to **Potato Point.** Mokelumne River enters from the eastward opposite Webb Point. **Potato Slough** enters from the eastward at Potato Point. Old River enters from the southward at this point. The channel then continues southward by **Haynes Point** to **Prisoners Point;** then enters the **Mandeville Cut,** crossing Middle River, and continuing through **Venice Cut** and through **Burns Reach,** it enters **Wards Cut,** where **Little Connection Slough** from the northward intersects. **Disappointment Slough** enters the channel from the eastward. **Hog Island Cut** is the last cut on the river, whence, to the Stockton Channel, the channel follows the river. Turner Cut enters Hog Island Cut from the southwestward.

Caution.—At Mandeville and Venice Cuts, care must be exercised by all in navigating the dredged channel of the San Joaquin River. The river still follows its old channel and violent sheers are experienced if the navigator is not prepared to meet the river current when passing from the cuts into the river and from the river into the relatively quiet waters of the dredged channel.

Directions, San Joaquin River.—Detailed directions are not given for this river. Deep-draft vessels should have no difficulty with the chart as a guide.

Pilots.—Pilots may be obtained by calling the offices of the Stockton Port District at the deep water terminal, Stockton, or at the San Francisco office of the Stockton Port District at 112 Market Street, San Francisco, or the Bay and River Pilots' Association, Pier 5, San Francisco. The pilots are licensed, commissioned, and bonded by the Stockton Port District. The pilot charges are from $20 to $60 each way depending upon the vessel's tonnage.

The following are extracts from the rules and regulations to govern the use, administration, and navigation of the **San Joaquin Channel:**

Maximum speed.—1. The maximum speed for all ocean-going craft shall not exceed 10 miles per hour above the lower end of New York Slough, shall not exceed 7 miles an hour above Prisoners Point, and shall not exceed 5 miles per hour while passing any wharf, dock, or moored craft.

Passing.—2. All craft passing other boats, barges, scows, etc., in motion, moored or anchored, shall slow down and take every necessary precaution to avoid damage.

Rights-of-way.—3. (*a*) United States dredges, tugs, launches, derrick boats, and similar plants of contractors executing work for the United States, and displaying the signals prescribed by the "Rules and Regulations Governing the Display of Signals on, and the Operation of all Crafts and Accessories Working on Wrecks, Engaged in Dredging, Surveying, or other Work of Improvement, and the Use and Navigation of the Waters in the Vicinity," prescribed by the Secretary of War, May 19, 1928, shall have *right-of-way* and other craft shall avoid interference with the work on which the plant is engaged. Dredges must, however, take special care to give ocean-going vessels sufficient room for passing, and must lift both spuds and the ladder, and pull clear, if an adequate width of clear channel-way cannot otherwise be provided. Ocean-going vessels may show at the masthead a black ball of not less than 20-inch diameter as a signal to the dredge, and may also blow 5 long blasts of the whistle when within a reasonable hearing distance of the dredge, such signal to be followed at the proper time by the passing signal described in the local pilot rules. The dredge shall promptly acknowledge both signals in the usual manner.

(*b*) Light-draft vessels when meeting or being overtaken by ocean-going vessels, shall give *right-of-way* to such vessels by making use of the shallower portions of the waterway.

(*c*) Rafts and tows must promptly give the channel demanded upon proper signal by a vessel, and

must be handled in such a manner as not to obstruct or to interfere with the free use of the waterway by the other craft.

Anchorages.—4. (*a*) Except in cases of distress or in heavy fog, vessels shall not anchor in the San Joaquin Channel nor in the Stockton turning basin, and if anchored under such circumstances shall be placed as near the edge of the channel or turning basin as possible, so as not to interfere with the free navigation thereof, nor obstruct the approach to any pier. They shall move as soon as the emergency ceases or when ordered by the district engineer.

(*b*) No vessel shall be permanently moored in streams tributary to the channel within ½ mile of the junction to the channel except upon permission in writing from the district engineer.

Stockton is situated in the center of the fertile San Joaquin Valley. The port was opened to deep water traffic in February 1933 and is developing rapidly. The harbor is located near the westerly city limits.

Towage.—It has not been necessary for towage companies to operate at this port because all vessels have operated under their own power.

Quarantine.—Information is given under San Francisco, page 127.

Customs.—A customs office is located at the port of Stockton general cargo terminal. No additional clearance is required at San Francisco Bay.

Tides and currents.—The mean range of the tide is 3 feet and the tidal current is negligible.

Dockage is charged only at the public wharves.

Wharfage is charged depending upon the class of merchandise.

Wharves.—There are three terminals at the Port of Stockton: the general cargo terminal for deep-draft vessels, the oil terminal, and the general shallow-draft terminal. The wharves for deep water shipping, of which there are eight, are on the southern side of the channel bordering the turning basin and also westward of the basin. All wharves, except No. 1, are of modern concrete construction, with a total berthing space of 3,400 lineal feet, capable of accommodating seven vessels at a time. These wharves are provided with ample transit shed areas, railroad facilities, and cargo handling equipment. The wharves eastward of the turning basin are for small craft and river steamers. The average depth alongside these shallow draft wharves is 9 feet.

Storage.—There are warehouses available for general cargo, grain, cotton, and cement and there are facilities for the storage of crude molasses and lumber. The oil terminal is at the northwestern end of **Rough and Ready Island** about 2.3 miles below the deep-draft general cargo terminal. It has berthing space for one ship. A bean-cleaning and a cotton compress are available.

Supplies.—Supplies and water may be obtained in any quantity. Gasoline and oil are available for small craft. There are no provisions for bunkering large vessels.

There is a **chart agency** of the U. S. Coast and Geodetic Survey situated here.

Lighterage.—There is practically no lighterage service, although produce is brought in from the surrounding delta territory by shallow-draft, self-propelled barges for shipside loading.

Repairs.—There are several small marine railways and a skidway at Stockton. Vessels up to 250 feet in length and 1,200 tons in weight have been hauled out for repairs on the skidway. A machine shop is available in case of emergency.

Communication.—Communication may be had to all points in the United States by railroad, bus or truck, airplane, telephone, and telegraph. There is a rapidly increasing steamship service.

Port Series No. 26 covers the port of Stockton.

TRIBUTARIES OF THE SAN JOAQUIN RIVER

(CHART 5527)

The **Mokelumne River** rises near the crest of the Sierra Nevada and empties into the San Joaquin River about 20 miles above the mouth of the latter.

The existing project provides for the removal of snags and obstructions and occasional dredging of shoals from the mouth of the river to Galt-New Hope Bridge, a distance of 35 miles, including both forks.

In June 1941, the controlling depths were as follows:

(1)	Mouth of river to lower junction north and south forks	12 feet
(2)	Lower junction north and south forks to Snodgrass Slough via north fork	9 "
(3)	Snodgrass Slough to upper junction north and south forks via north fork	2 "
(4)	Lower junction north and south forks to upper junction of same at New Hope Landing via south fork	8 "
(5)	New Hope Landing to Galt-New Hope Bridge	3 "

†In _____ 19____, the controlling depths in the channels were: _____

_____

_____

The Western Pacific Railroad has warehouses at **Terminous** on the south fork at its junction with **Little Potato Slough;** otherwise commodities are handled on small wharves or landings, or at the banks at various points.

The **Old River** is the most westerly branch of the interconnecting tidal channels into which the San Joaquin River divides in crossing its delta. The project provides for the easing of three sharp bends in Old River between its mouth and **Orwood** (Sante Fe) Bridge; a channel 10 feet deep to the Sante Fe Wharves and Phillips Cannery at Orwood Station; entrances 8 feet deep to the Fabian-Belle Canal at its westerly end, and just westward of the Grant Line Highway Bridge; enlargement of Grant Line Canal, westward of Doughty Cut, to a depth of 10 feet; a channel 10 feet deep from the westerly end of Doughty Cut to the Holly Sugar Factory; a channel 8 feet deep from the southerly end of Doughty Cut to the head of Old River; and a channel 6 feet deep in the original channel of Old River from the westerly end of Grant Line Canal to the Lammers Ferry Road.

In June 1941, the controlling depths were as follows: From the mouth of the river to Orwood, 10 feet; thence to the lower end of Grant Line Canal, 9 feet; thence (a) to Holly Sugar Factory near Tracy 4.5 feet, and (b) to the head of Old River in San Joaquin River, 5.5 feet. †In _____ 19____, the controlling depths in the channels were:_____

_____

_____

Middle River and connecting channels are a part of a complicated network of tidal channels, some natural and some artificial, in the delta of the San Joaquin River. Middle River, one of the principal channels, is a by channel of the San Joaquin, leaving Old River above the city of Stockton and rejoining the main river about 15 miles below the city. **Whiskey Slough** enters the San Joaquin 6 miles upstream from Middle River and is connected by **Empire Cut,** an artificial waterway, with **Latham Slough** and Middle River. **Turner Cut** is an artificial cutoff at the mouth of Whiskey Slough.

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

The project provides for a channel 9 feet deep in Middle River below Borden Highway Bridge; in Latham Slough between Middle River and Empire Cut; and in Empire Cut, Whiskey Slough, and Turner Cut between Middle River and San Joaquin River. In June 1941, the controlling depth was 9 feet in all of the channels. †In _____ 19____, the controlling depths in the channels were: _____ 5

_____

Mormon Slough enters the Stockton Channel from the southeastward at the end of the turning basin. The project provides for a channel 9 feet deep to Center Street, the head of navigation, 1.7 miles above the mouth. In June 1941, the controlling depth in Mormon Slough was 3.5 feet. †In _____19 ____, the controlling depth 10 in the channel was: _____.

SACRAMENTO RIVER

The **Sacramento River** enters the eastern side of Suisun Bay on the northern side of Sherman Island. The river has been improved by dredging to Sacramento, and by snagging to Red Bluff, about 246 miles above the mouth. The project provides 15 for a channel 10 feet deep from the mouth to Sacramento; thence 6 feet deep to Colusa; thence 5 feet deep to Chico Landing; thence by such depths as practicable to Red Bluff. In September, 1940, the controlling depths were as follows: From the mouth of the river to the mouth of Cache Slough, 20 feet; thence to Sacramento, 10 feet; thence to Colusa, 3 feet; thence to Butte City, 2.7 feet; and thence to Sidds Landing, 2.5 feet. †In 20 _____, 19___, the controlling depths in the channel were_____

_____

_____

There is no regular navigation above Sidds Landing, 178 miles above the mouth.

There is irregular steamer service between San Francisco and river landings as far 25 as Sacramento. Most of the river landings have now been abandoned; produce is handled by truck. A number of bridges and submarine cables cross the river. The submarine cables are marked by signs.

Currents in the Sacramento River are a function of the river stage. During high river periods, the flood current is entirely masked above McNear Island and strong 30 river currents exist to Sacramento. During the dry season, a flood current can be carried to Paintersville and from there slack water to Freeport. In ordinary dry seasons the current does not reverse at Sacramento, but there is a record of a reverse current at one time of extreme low water. Local knowledge is required to make an estimate of current conditions for a particular time. 35

SACRAMENTO RIVER, MOUTH TO WALNUT GROVE

(CHART 5527)

Rio Vista, about 9.5 miles above the mouth of the river, is the most important town commercially below Sacramento. It is the only intermediate stop for the large river passenger steamers that ply between San Francisco and Sacramento daily. Gas- 40 oline, diesel and lubricating oils, and provisions may be obtained. There are hotels, telephone, and bus service. A highway bridge with a double bascule span crosses the river at the northern end of the town; horizontal clearance 198 feet, vertical clearance 12.5 feet above MHW.

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

At a distance of about 1.4 miles above the highway bridge the river turns sharply eastward and **Cache** and **Steamboat Sloughs** enter from the northward.

Isleton is about 4 miles above Rio Vista. It is the site of what is reported to be the largest asparagus cannery in the world. There is an oil landing where gasoline and other petroleum products may be obtained; supplies may be obtained in moderate quantities. Communication may be had by rail, telegraph, telephone, or bus. A highway bridge with a double bascule span crosses the river about 0.5 mile above Isleton; the horizontal clearance is 200 feet, the vertical clearance is 12½ feet above MHW.

Ryde is a small village with a hotel and telephone communication, about 5 miles above Isleton. Gasoline and provisions may be obtained in small quantities.

Georgiana Slough enters the Sacramento River from the southward about 2.1 miles above Ryde. There is deep water the entire length of the slough. River steamers have made the run from Sacramento to Stockton via Georgiana Slough, Mokelumne River and San Joaquin River at all stages of the Sacramento River. In the slough, great care is necessary in making sharp turns about 1 mile and 3 miles southward of the mouth, and also in making the triple horseshoe bend about 2.5 miles northward of the entrance into Mokelumne River.

SACRAMENTO RIVER, WALNUT GROVE TO SACRAMENTO

(CHART 5528)

Walnut Grove is located about 2.8 miles above Ryde; it is the site of several canneries. Gasoline, oils, and supplies may be obtained in moderate quantities. There are railroad, telephone, telegraph, and paved highway connections. The river is crossed here by a highway bridge with a double bascule span; the horizontal clearance is 194 feet, the vertical clearance is 19 feet at MHW. Five miles above Walnut Grove, at the small village of **Paintersville,** the river is crossed by another highway bridge of the same type and clearances.

Steamboat Slough leaves the river about 0.8 mile southward of the Paintersville Bridge. There is a small slough entering the western bank about 0.55 mile above the bridge which connects with the junction of **Sutter** and **Elkhorn Sloughs.**

Courtland is situated about 6 miles above Walnut Grove. Supplies may be had in moderate quantities, and gasoline and oils may be obtained from an oil company's landing. There are hotel accommodations and telephone and telegraph service.

Hood is a small village about 3 miles above Courtland. It is a shipping point on the Southern Pacific Railroad.

The small village of **Clarksburg** is about 2.8 miles above Hood. Two oil companies have landings here and it is a distributing point for petroleum products.

Freeport is a small town about 3 miles above Clarksburg. Gasoline, oils, and provisions may be obtained in small quantities. There is railroad, telegraph, and telephone service. The Freeport bridge with a bascule span has a 200-foot horizontal clearance.

There are two bridges at Sacramento: The Capitol Street bridge is a lift bridge with a horizontal clearance of 170 feet and a vertical clearance at high water flood of 101 feet when raised; the I Street bridge is a swing bridge with a horizontal clearance of 150 feet.

A paved highway between Antioch and Sacramento runs along the levee of the river for nearly its entire distance.

Directions, Sacramento River.—From a position 200 yards northward of Mallard Island car ferry slip (see page 138), steer **087°** for 1.35 miles to a position 200 yards northward of lighted bell buoy off New York Point; then the course is **053°**, distance 1.6 miles to a position 150 yards northward of buoy 12 and about 300 yards southward of lighted buoy off east end of **Van Sickle Island.** Alter course gradually to **085°**, distance on course 1.2 miles to a position 200 yards southward of Point Sacramento Light. Light buoy northwest of **Fraser Shoal** will be passed 100 yards to starboard. When abeam Point Sacramento Light, change course to northward and then set a mid-channel course. Keep to mid-channel or slightly favor the western shore until Rio Vista is reached. The bridge opening here is on the western side of the river. Take the right hand or eastern fork 1.4 miles above the Rio Vista Bridge keeping near mid-channel and favoring the ebb-tide bends. **Ida Island** lies 1.2 miles above the above mentioned fork.

From Ida Island for a distance 3.5 miles upstream there are shifting shoals. After passing Ida Island, work gradually over to the southern shore and keep within 200 feet or less of it until near the bridge above Isleton, then gradually work over to the western half of the channel and favor that side around the next bend. From this point to Clarksburg, the channel is all clear and mid-channel courses may be followed favoring the ebb-tide bends. At Clarksburg favor the eastern shore a little until just past the town then swing into mid-channel again. From just below Freeport the channel is rather shoal and wing dams have been built at several places to scour out the channel. These are covered at high water stages and may be struck if the shore is approached too closely. By favoring the ebb-tide bends no trouble should be encountered from here to Sacramento.

Note.—Care should be exercised at all times not to get too close to the levees, as most all are faced with rock, and damage to vessels may easily be sustained if the vessel drags along the levees.

Sacramento, the State capital, is the head of navigation for most of the shipping on the river. A draft of well over 10 feet can be carried to Sacramento except at low river stage, which usually occurs during July, August, and September. Dredges work as needed during this period to maintain a depth of 10 feet.

Pilots.—The River Lines, acting for the city of Sacramento, will furnish pilots between Sacramento and other points on the Sacramento River, San Joaquin River, and San Francisco Bay area on call.

Towage.—Towboats will be furnished by the River Lines on call.

Quarantine, customs, and **immigration.**—Control is exercised by the offices of these services having jurisdiction over San Francisco Bay. See page 127.

Tide.—At lowest river stages the mean range of tide at Sacramento is 2.3 feet, but at other stages it is negligible.

Currents.—See page 147.

Wharves.—There are 15 piers and wharves on both sides of the river, which have a combined actual berthing space of 3,519 linear feet and serve approximately 201,600 square feet of transit shed area. There are a few storage warehouses in addition to the transit sheds.

Supplies.—Fuel and diesel oils, and water are available; coal for bunkers is not supplied.

Lighterage.—Nearly all freight is handled by shipside loading, shifting the ship if necessary.

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Repairs.—There is a skidway with a depth of water over the foot of about 3.5 feet at extreme low water.

Communications.—Two railroads serve the city. There is airplane service in all directions.

Port Series No. 26 covers the port of Sacramento.

DUXBURY POINT TO POINT REYES

(CHART 5599)

From Duxbury Point, see page 119, the coast swings northwestward for about 1.3 miles to Bolinas Point.

Bolinas Point, 160 feet high, is the western point of the comparatively level tableland extending eastward to Bolinas Lagoon. Owing to its proximity to Duxbury Point it is not particularly prominent. The radio towers of a large commercial transmitting station, about 0.6 mile northward of the point, are prominent. There are about 20 steel towers and nearly 100 wooden towers covering an area about 0.5 mile square with no apparent design when viewed from seaward and no particularly prominent tower. The power house, brown with red roof, is about the most conspicuous part of this station.

From Bolinas Point to Double Point, about 3.5 miles, the coast is bold with high, rocky cliffs bordered by narrow sand beaches and no outlying dangers outside the 10 fathoms curve.

Double Point has two high spurs about 0.4 mile apart extending 320 and 200 yards from the coastline. The southern, which is the longer and lower spur, has a rock close under the point and nearly connected with it at low water. About 250 yards off the northern spur, is a small island, 47 feet high.

From Double Point the rocky cliffs 100 to 200 feet high, extend westward and northward for about 6 miles to the sand dunes near the eastern part of Drakes Bay.

Drakes Bay affords shelter in northwesterly weather in 5 to 6 fathoms, sandy bottom. From the western headland, which is the eastern termination of the ridge forming Point Reyes, high, white cliffs extend northward and eastward in a gentle curve for 6 miles, teminating in high, white sand dunes. Several lagoons on the northern shore empty through a common channel which is navigable by light-draft vessels with local knowledge. The western point is 230 feet high, with **Chimney Rock,** a detached rock, lying close under the eastern extremity. A reef, which breaks in moderate weather, extends more than 0.5 mile eastward of the point. The harbor is used extensively by vessels in heavy northwesterly weather. Shelter has been obtained in southeasterly weather, close under the western point, in 4 fathoms, sticky bottom, the force of the swell being broken by the reef off the point. This anchorage, however, is not recommended. No directions for entering are necessary, other than to give the point a berth of not less than 0.8 mile to avoid the reef previously mentioned. The telegraph cable to Farallon Island is laid close around the inside of the reef off the point and landed abreast the first depression in the ridge westward. Vessels should avoid anchoring near it. There is a wreck in 12 fathoms about 4.4 miles 75° from Point Reyes Coast Guard station.

Point Reyes is a bold, dark, rocky headland, nearly 600 feet high, which is the western and higher extremity of a ridge running in an easterly direction for 3 miles. There is low land northward of it, so that from northward and southward it is usually made as an island, and also from seaward in hazy weather. It is visible

for over 25 miles, and can be seen off Point Bonita, the northern headland at the entrance to the Golden Gate.

Point Reyes Light*, shown from a white pyramidal tower, is situated on the western extremity of the point. The light is 294 feet above the water, visible 24 miles. The fog signal, an air diaphone, is established on the western pitch of Point Reyes about 130 feet below the light. The fog signal sounds 5 or 6 short blasts and a blast of 15 seconds to warn the Coast Guard crew when vessels are in distress. A storm warning display and seacoast telegraph and reporting station is situated on the northwesterly end of the high ridge back of the lighthouse. The station is equipped for signaling with the international code, and will transmit messages of passing vessels. There is a telephone line to San Francisco.

The **Point Reyes Coast Guard station** is located on the western side of Drakes Bay, about 2.4 miles eastward of Point Reyes Light.

A radio direction finder station is located on the beach about 2.8 miles northward of the light. See *Radio Navigational Aids*, H. O. Publication 205.

Two sunken rocks with about 3 feet over them lie about 275 yards westward of Point Reyes Light. These rocks break in a moderate swell.

POINT REYES TO BODEGA HEAD

(CHART 5603)

From Point Reyes, the coast trends in a general northerly direction for about 10 miles, as a broad, white, sand beach, backed by high, grassy sand dunes.

A commercial radio receiving station is located about 7 miles northward of Point Reyes; the large white building is prominent from seaward. There is a radiotelephone receiving station about 0.5 mile southwesterly from this station; it is not prominent.

The entrance to **Abbotts Lagoon,** about 7.5 miles northward of Point Reyes, is completely closed by a sand and gravel bar.

From the northern end of the sand beach, the coast curves northwestward for about 6 miles in high, yellow, rocky cliffs, terminating in **Tomales Point,** the southern point at the entrance to Bodega Bay. **Bird Rock,** small and rocky, 60 feet high, lies 0.6 mile southward of the point and about 0.2 mile offshore.

Bodega Head, 250 feet high, lies about 4.5 miles northwestward of Tomales Point. The summit is rounding and grassy, with steep, rocky cliffs on the southern and western ends. **Bodega Rock,** low in elevation, lies 0.3 mile southeastward of the southeastern face of the head. Foul ground extends 0.4 mile southward and southeastward of the rock. A lighted whistle buoy is moored about 1.1 miles southwestward of Bodega Rock.

Bodega Bay, included between Tomales Point and Bodega Head, is about 6 miles in length in a northwesterly direction, with a width of 1.5 miles. It affords shelter from northwesterly weather at its northern end, but is dangerous in southerly or westerly weather. **Bodega Harbor,** northward of the bay, has jetties and a dredged channel, 100 feet wide and 12 feet deep, from the entrance to the town of **Bay,** thence southward along the shore for a distance of 4,200 feet; suitable turning basins are provided.

To anchor in Bodega Bay, round Bodega Rock, giving it a berth of 0.8 mile, until Bodega Head bears 280° and is just open northward of Bodega Rock, then steer **333°** for about 0.8 mile and anchor in 30 to 36 feet, 0.5 mile from the beach, with Bodega

*Lat. 37°59′.7, Long. 123°01′.3: Charts 5599, 5603, 5402, 5502, 5020, 5052, 9000.

Rock bearing about 215°. Anchorage may be had closer to the beach if the vessel's draft permits. On the approach of southerly or westerly weather, vessels should leave at once.

Tomales Bay enters the southern part of Bodega Bay immediately eastward of Tomales Point, and extends southeastward for about 12 miles with an average width of 0.5 mile. A whistle buoy is moored 0.8 mile northwestward of **Tomales Bluff,** and the bar which has 8 to 9 feet over it, is marked by an outer bar bell buoy and an inside bar black buoy. Some farm products, fish, and clams are shipped from here to San Francisco. Communication may be had by rail and telegraph from points at the head of the bay. There is an excellent paved highway along the eastern shore of the bay paralleling the old Northwestern Pacific Railroad, the tracks of which have been taken up. **Point Reyes Station** is at the head of Tomales Bay.

At the entrance to Tomales Bay a current of 6 knots may be encountered on a spring tide. The bar is dangerous and should not be attempted by a stranger.

COAST FROM BODEGA HEAD TO POINT ARENA

(CHART 5502)

The coast from Bodega Head to Point Arena, about 57 miles, trends in a general northwesterly direction. There are but few dangers and these do not extend over a mile from shore, and in thick weather the 30-fathom curve may be followed with safety. During the summer months, the rocks are generally well marked by kelp, which extends in some cases to the 10-fathom curve. During the winter gales much of this is torn away and it is a safe rule to avoid all kelp.

In clear weather the mountains inland may be readily seen, and at times are visible when the lower land is shut in by haze or fog. In thick weather soundings should be taken frequently, as the currents are extremely irregular both in direction and velocity.

Protection from the prevailing northwesterly winds of summer may be had at several places, but there is no shelter from the winter winds, which are usually accompanied by a heavy westerly swell.

Northward of Bodega Head, the cliffs are about 200 feet in height for 2 miles, and then are succeeded by a broad sand beach 2 miles long, backed by sand dunes, 120 feet high. From this point the coast northward consists of abrupt, rocky cliffs, broken by gulches, to the mouth of the Russian River, about 10 miles northward of Bodega Head.

Numerous rocks, from 20 to 130 feet high, lie offshore, in some cases over 0.3 mile. **Gull Rock,*** 100 feet high, lies about 1.7 miles southeastward of the mouth of Russian River and 0.3 mile offshore. About 0.5 mile northwestward of Gull Rock and 400 yards offshore, is a large arched rock, 85 feet high and flat on top. This is the largest arched rock on this part of the coast.

Duncans Landing, about 6 miles northward of Bodega Head, is an excellent small boat landing in northwesterly weather.

The spit making out from the southern point of the mouth of **Russian River** has been partially reinforced by a rock jetty for the purpose of keeping a passage open across the bar. Rock is obtained from the sharp point immediately to the southward of the river. From the southward this point appears as an island; it is connected to the mainland by a low strip which bares at HW.

Ross Mountain, 2,205 feet high, is the highest knob on the ridge backing the coast

*Lat. 38°25′.5, Long. 123°07′.2: Chart 5502.

northward of Russian River and lies about 3 miles inland, northward from its mouth. It has a few clusters of trees near the summit; the slopes are bare of trees and the gulches are wooded.

From Russian River to Fort Ross Cove, the coast is high, consisting of bare, steep spurs from Ross Mountain. A sunken reef extends about 0.8 mile from shore 4.5 miles northwestward of Russian River. It is marked by a lighted whistle buoy moored about 0.3 mile southward of the reef. Vessels should not attempt to pass eastward of the buoy.

Fort Ross Reef (Pinnacle Rocks) lies about 5.7 miles northward of Russian River and nearly 1 mile eastward of Fort Ross Cove. The rocks are 35 feet high, about 600 yards offshore, and connected with the beach by a reef which is partially marked by kelp.

Fort Ross Cove, about 15 miles northward of Bodega Head and nearly 33 miles northward of Point Reyes, affords fair shelter in northwesterly weather. The holding ground is poor and the anchorage is contracted by a rock, awash, in the middle of the cove and a sunken rock about 50 yards northward of it with but 14 feet over it. The cove is divided into two bights, the western one being slightly the larger. This anchorage is suitable for small vessels only, and if used by strangers should be entered with caution, as no directions can be given that would be of value. Communication by paved highway and telephone may be had with the interior.

Fort Ross was first settled by the Russians in 1811, and the old Russian church is still standing. There is no commerce here now, and the landing facilities have been abandoned.

From Fort Ross Cove, the coast extends northwestward and is nearly straight. It is bold and wooded to the crests of the hills, which approach the coast closely. It is cut by numerous gulches and bordered by many rocks, which, as a rule, are close inshore. Several landings, practically all abandoned, are situated along this stretch of the coast. The 30-fathom curve is at an average distance of 0.7 mile from shore from Fort Ross Cove to near the Gualala River.

Salt Point, about 5 miles northward of Fort Ross Cove, is about 35 feet high, very rocky, and bare of trees; it is bordered by outlying rocks for about 200 yards. The 30-fathom curve is less than 0.5 mile off this point.

Gerstle Cove, or **Salt Point Landing,** is a contracted cove and landing under Salt Point, and is now abandoned.

Fisk Mill Cove, 2.5 miles northward of Salt Point, affords fair shelter for small vessels in northwesterly weather. The bottom is rocky, but there are no hidden dangers.

Horseshoe Point, about 3 miles northward of Salt Point, is a cliff 180 feet high, with a depression of 60 feet immediately behind it. It is bare of trees; the summit is marked by several projecting rocks.

From Horseshoe Point, the coast trends northwestward for about 12.5 miles to the Gualala River, and consists of cliffs about 60 feet high, bordered by numerous outlying rocks. The tree line is from 0.1 to 0.5 mile back from the edge of the cliffs.

Stewarts Point* is a village with a post office about 3 miles northward of Horseshoe Point. It is in a small cove that was formerly used as a shipping point. About 350 yards off the southern point of the cove are two sunken rocks, each of which is well marked by kelp. The cove is a fair shelter for small craft in northwesterly weather. There is a general store, and the buildings are readily made from seaward. Communi-

*Lat. 38°39′.3, Long. 123°24′.5: Chart 5502.

cation may be had by telephone and bus over improved roads north and south and to the interior.

Black Point Landing is about 5.5 miles northwestward of Horseshoe Point. It is unprotected and the landing is no longer used.

About 4 miles northwestward of **Black Point** and 3 miles southeastward of the Gualala River is a sand beach about 0.5 mile long, backed by high sand dunes parallel with the beach. These dunes are quite prominent.

Del Mar Landing is located about 5 miles northwestward of Black Point and 2 miles southeastward of Gualala River. It is unprotected, and wire cable for loading is no longer used.

Local magnetic attraction has been reported in the vicinity of Del Mar Landing and Saunders Reef, amounting to 4° to 8° easterly of the normal magnetic variation.

Gualala Point Island lies about 16 miles southeastward of Point Arena and 1 mile southward of the Gualala River. It is 42 feet high, about 300 yards offshore, and connected with the bluff by a rocky reef, covered with sand and bare at high water. Sand dunes extend behind the bluff for 600 yards.

The **Gualala River** intersects the coast about 15 miles southeastward of Point Arena. A long sand beach extends a mile southward from the mouth. The mills at **Gualala** were not in operation in 1934.

Robinson Reef lies northward of the mouth of the Gualala River and 1.1 miles northward of Gualala Point Island. It consists of a cluster of 25 or 30 rocks above water, about 600 yards offshore, with a sunken rock, 70 yards west-northwestward of the outer visible rock.

Bournes Landing (Bowen Landing) is about 1.5 miles northwestward of the Gualala River. The anchorage here is exposed and can be used only in the summer. Local knowledge is necessary because of several sunken rocks in the approaches. Lumber from the Gualala mills was formerly shipped from here. There is an improved highway paralleling this section ot the coast.

Havens Anchorage is 12 miles southeastward of Point Arena, and 4 miles northwestward of Gualala Point Island. Shelter from the prevailing northwesterly winds may be had in the cove southward of Fish Rocks. Vessels of 200 tons may use the cove, which is contracted by rocks and sunken ledges extending 250 yards southeastward from the western head. Strangers should approach the anchorage with caution. Some lumber, ties, and tan bark have been shipped from this point, but it has not been used commercially for several years. Communication may be had by bus and telegraph.

Fish Rocks are two rocky islets, about 4.2 miles northwestward of Gualala Point Island, connected at low water with the shore and surrounded by numerous smaller rocks. The outer rock is 150 feet high, and the inner 100 feet high and 100 yards offshore. A rock, 40 feet high, lies 175 yards southeastward of the outer rock.

Havens Neck is a prominent head, 145 feet high, about 0.6 mile northwestward of Fish Rocks. It is bare of trees and connected with the bluffs by a narrow neck.

Gualala Mountain, 2,210 feet high and heavily wooded, is a prominent feature in clear weather. It is about 5 miles inland northeastward of Havens Neck.

Sail Rock, 44 feet high, is a sharp, pyramidal rock, 800 yards offshore, about 2.8 miles northwestward of Fish Rocks. From off Point Arena it resembles a small vessel under sail.

Saunders Reef, about 4.5 miles northwestward of Fish Rocks, lies a little over 0.5 mile offshore. It shows several rocks awash at low water and is well marked by kelp.

Foul ground exists between it and the shore. A lighted whistle buoy is moored 0.4 mile southwestward of the outer rock and 7.5 miles southeastward of Point Arena. Vessels should not pass inside the buoy.

Arena Cove lies about 2.5 miles southeastward of Point Arena; it is a slight indentation affording shelter to small vessels in northwesterly weather. The southern head is a high yellow cliff that under favorable circumstances is visible for a considerable distance seaward. A wharf in fair condition is at the head of the cove, with 14 feet at its outer end. Some provisions may be had and water obtained by hose. The village of **Point Arena** is situated about 1 mile back from the landing. It has a post office and communication may be had by bus and telegraph. A Coast Guard station is located in the cove. A lookout tower, white enclosure with a red roof on a steel tower, is prominent. A bell buoy is moored 0.6 mile southwestward from the end of the wharf.

To enter, make the bell buoy; then bring the end of the wharf to bear **074°** and stand in on this course. This leads about 150 feet southward of a rock, with 16 feet over it, that lies 300 yards 264° from the end of the wharf. In thick weather during the summer, in approaching the cove from northward or southward, the edge of the kelp may be followed, which will lead to within 300 yards of the bell buoy.

A break is reported in heavy southwesterly swell about 0.8 mile west-southwestward of the northern point of Arena Cove, and scattered kelp extends almost out to that position.

There is a prominent oil derrick about midway between the Coast Guard Lookout Tower and Point Arena Light. It is on the low point near its outer extremity.

Point Arena is the first prominent point northward of Point Reyes. It consists of a long, level plateau, diminishing in height to the end of the point, which is 60 feet high. The point is bare of trees for about a mile back of the point.

Point Arena Light* is shown from a white cylindrical tower at the extremity of the point. The light is 155 feet above the water and visible 19 miles. The fog signal is a two-tone air diaphone. There is a radiobeacon equipped for distance finding on the point.

A sunken reef, usually showing breakers, extends about 0.6 mile northwestward from the extremity of the point.

Arena Rock, with 13 feet over it, lies a little over 1.2 miles 346° from Point Arena Light and shows a breaker except in very smooth weather. A sunken rock which breaks only in heavy weather has been located about 200 yards northward of Arena Rock. It is thought to be a part of Arena Rock, and should be given a good berth as it rises abruptly from deep water.

Caution.—In view of the fact that Arena Rock is only 0.8 mile inside the 30-fathom curve, and that the shoaling is abrupt, vessels approaching Point Arena from northward in thick weather are advised to keep outside a depth of 40 fathoms.

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*Lat. 38°57′.3, Long. 123°44′.4: Charts 5502, 5602, 5002, 5052, 9000.

Chapter 9.—POINT ARENA TO TRINIDAD HEAD

(CHART 5602)

From Point Arena, the coast extends in a general north-northwesterly direction for about 50 miles and then trends west-northwesterly for nearly 35 miles to Punta Gorda, from which point it trends north-northwesterly for 10 miles to Cape Mendocino. The southern portion is less bold and rugged than the northern portion, and the mountains are neither as high nor as close to the coast. The dangers are all included within the 30-fathom curve, and with the exception of Blunts Reef and the other reefs in the vicinity of Cape Mendocino, do not extend more than a mile offshore. Between Point Delgada and Cape Mendocino are several deep submarine valleys, heading in some cases within 0.5 mile of the beach; great caution and frequent soundings are necessary in thick weather when in the vicinity, owing to the irregularity of the currents and soundings.

From Cape Mendocino to Trinidad Head, the coast trends in a northerly direction for 40 miles and, with the exception of the rocks off False Cape, is free of dangers if the beach is given a berth of over 0.5 mile. The land is generally low with sandy beaches, broken by the mouths of the Eel and Mad Rivers and the entrance to Humboldt Bay, the only marked elevations northward of False Cape being Red Bluff and Table Bluff.

In clear weather, the mountains are good landmarks and can frequently be seen when the lower land is obscured by fog or haze.

POINT ARENA TO GREENWOOD

(CHART 5602)

Protection from the prevailing northwesterly winds of summer may be had in a few places, but there is none from southward or westward.

From Point Arena, the cliffs of the point extend 0.5 mile northeastward to the mouth of the **Garcia River,** from which sand dunes and beaches extend northward for about 4 miles. Beyond this for 40 miles to **Ten Mile River Beach** the coast is rugged, with high, bold cliffs bordered by numerous outlying rocks.

Mal Pass is a steep gulch about 5.2 miles northward of Point Arena; the bluffs on each side are nearly 280 feet high.

There is a prominent reddish cliff, **Red Bluff,** about 200 feet high, 8 miles northward of Point Arena.

Elk Rock, 95 feet high and 0.5 mile offshore, lies about 8.5 miles northward of Point Arena.

GREENWOOD TO FORT BRAGG

(CHART 5703)

Greenwood (**Elk P. O.**) is about 10.5 miles northward of Point Arena. The ruins of an incline from the 150-foot cliff down to the most easterly of a cluster of three large rocks are prominent. The shelter is only fair. Communication may be had by bus and

telephone. Provisions may be had in limited quantities. The yellow and red church spire with cross, near the northern part of the town, is prominent from southwestward, and the group of cypress trees in the graveyard 500 yards northward from Cuffey Cove, is a good landmark from any direction. **Nose Rock,** 24 feet high, lies about 0.6 mile southwestward of the cliff. **Casket Rock,** 91 feet high, is the outermost of the three large rocks westward of the cliff.

Approaching from the southward, steer **082°** heading for the yellow and red church spire with cross. This course passes about 200 yards southward of a group of sunken rocks with a least depth of ¾ fathom over them.

Cuffey Cove, about 0.8 mile northward of Greenwood, is a small, contracted anchorage affording fair shelter in northwesterly winds. The outer point at the entrance to the cove is 140 feet high, with a rocky islet 49 feet high 450 yards westward and a series of three small offlying rocks extending 170 yards southwestward. Immediately east of this point is an inlet 300 yards long which is an excellent anchorage for small boats in northerly and westerly weather. A small kelp-covered rock, awash at low tide, lies near the center of the entrance to the inlet, and boats enter midway between this rock and the point. Vessels entering the cove pass midway between the rock awash, at the entrance to the inlet, and the foul ground 300 yards southward of the inlet. The cove is covered with patches of kelp during most of the year. The landing and village are abandoned.

From Cuffey Cove to the **Navarro River,** a distance of about 3 miles, the coast consists of cliffs 200 feet high, bordered by outlying rocks.

Navarro Landing, at the mouth of Navarro River, is now abandoned. There is fair shelter from northwesterly winds. A small landing is situated about 0.2 mile up the river from the entrance; small boats with local knowledge of river conditions use the place occasionally. The only supplies available are gasoline and oil.

Navarro Head, 405 feet high, is located on the northern bank of the Navarro River.

Salmon Point*, the southern entrance point to Whitesboro Cove, about 1.2 miles northward of the Navarro River, is a treeless cliff, 109 feet high. Detached rocks extend westward of the point for 0.2 mile, with a sunken ledge usually showing a breaker 0.5 mile west by northward of the extremity of the point. This ledge is locally known as **Bull Rock.** In heavy swell there are breaks showing between it and the visible rocks off the point.

ALBION TO CASPAR

(CHART 5711)

Albion River and **Whitesboro Cove** are about 2 miles northward of Navarro Head and 16.5 miles northward of Point Arena. The cove affords good shelter in northerly weather, but is open southwestward. The south point at the river entrance rises to a knoll 179 feet high, and lies 0.7 mile from Salmon Point. Low rocks extend nearly 0.25 mile westward of the point. The north point is a rocky islet, 80 feet high, lying close to the point, which has the same elevation; both are bare. Small visible rocks lie 200 yards westward of the islet, and sunken rocks, showing breakers in a moderate swell, extend out more than 0.25 mile west-southwestward from it. Two hundred and fifty yards southward of the islet, and fairly in the middle of the entrance, lies a sunken rock, usually showing a breaker, which is the principal danger in the approach. In

*Lat. 39°12′.9, Long. 123°46′.6: Charts 5602, 5703.

the middle of the cove, as seen from seaward, lies a pyramidal rock about 30 feet high, known as the **Mooring Rock,** from which small rocks stretch to a point on the northern shore. A whistle buoy is moored off the cove nearly 0.6 mile 261° from Mooring Rock.

The village of **Albion,** which has a post office, is situated on both high banks of the river. Considerable lumber was formerly shipped to both foreign and domestic ports, but the sawmill has not been operated since 1928 nor has there been any shipping since. Communication may be had by bus, truck, and telephone. Water and some provisions but no coal may be obtained here.

To enter.—From the whistle buoy head for the Mooring Rock, course **081°,** until within 200 yards of it.

Northward of Albion River, between it and Colby Reef, breakers are seen in heavy swell nearly 0.5 mile from shore, and vessels should not approach closer than 1 mile.

Stillwell Point is a bold, sharp cliff 190 feet high, about 1.6 miles northward of Albion River. A rocky islet, 141 feet high, lies close inshore on its northwestern side. There is a yellow slide on the southern face of Stillwell Point.

Colby Reef, 1.6 miles northward of Albion River, lies 0.5 mile offshore, abreast Stillwell Point. It consists of a rocky patch with a least chartered depth of 1½ fathoms. There are numerous other dangers just inside the 20-fathom curve along this stretch of coast.

Little River lies 4.6 miles northward of Navarro Head and about 19 miles northward of Point Arena. The northwestern shore of the cove is bluff and rocky, and bare of trees for over 0.5 mile. Good shelter from northwestward and fair protection from southward is afforded by the reef and rocks on the southern side of the cove, which are well marked by kelp. It is open westward, and bad, especially for sailing vessels, owing to the narrow entrance and heavy undertow when in the vicinity of the rocks. The anchorage is about 300 yards in diameter, with depths of 4 to 4½ fathoms. The channel in entering is about 125 yards wide but is obstructed by two sunken rocks which reduce it to about 60 yards in width abreast the inner visible rock. Strangers should not enter without a pilot. No supplies are obtainable. Communication may be had by bus, truck, and telephone.

From Little River to Mendocino Bay, the coast is a broad tableland with a seaward face of cliffs, 40 to 60 feet high, bordered by numerous low rocks. The tree line is over 0.5 mile from the cliffs.

Mendocino Bay lies about 21 miles northward of Point Arena, and affords fair shelter in northwesterly weather, but vessels are obliged to leave in southerly or westerly weather. In heavy southwesterly gales the sea breaks clear across the entrance. The bay is about 0.8 mile long in a northerly direction, with a width of a little over 0.3 mile. The northern point at the entrance is a broken cliff, 60 feet high, bordered by numerous rocks close inshore. The southern point is a rocky, irregular cliff 100 feet high, bordered by numerous rocks, with a reef extending 150 yards northwestward toward the northern point. A continuation of this reef, in the form of a rocky area having a least depth of 3¼ fathoms, extends northwestward of the outermost bare rock a farther distance of 500 yards. This area should be avoided when there is any swell running. A knoll, 156 feet high, lies 300 yards back from the southern point.

The town of **Mendocino** is situated on the northern shore of the cove; **Big River** enters in the northeastern part of the cove. A sawmill is situated about 0.5 mile above the mouth on the north bank; the old loading tower and track system are in poor condition. The sawmill has been shut down since 1939. There are some old mooring floats

in position under the cableway, which may be used as a guide in anchoring. Provisions, fresh meat, and water, may be had; coal is not available. Communication may be had by bus, truck, and telegraph or telephone. The buildings in the town are the prominent features when in the vicinity of the bay.

To enter, bring the south bluff of the river to bear **068°** and stand-in on that bearing, passing 100 yards southward of the bell buoy and giving the northern point at the entrance a berth of 250 yards. When this northern point is a little abaft the beam, anchor in from 5 to 6 fathoms. This course clears the dangerous sunken ledge, lying 500 yards northwestward of the outer visible rock off the southern point.

Russian Gulch, 2 miles northward of Mendocino, is a small indentation of no commercial importance. The cove is occasionally used as an anchorage by small craft with local knowledge as it affords excellent protection. Three piles showing 1 to 2 feet above MHW are all that remain of a small wharf built in the northern cove. The new concrete arch bridge (highway) across Russian Gulch should show well from southward to westward. An important danger is a rock, awash, lying 400 yards 284° from the southern entrance point. A reef with a least depth of 1¼ fathoms, extends 200 yards southeastward of the rock.

Point Cabrillo is about 3 miles northward of Mendocino City and 24 miles northward of Point Arena. It is a flat-topped point, 50 to 60 feet high, terminating seaward in nearly vertical cliffs; numerous low rocks extend offshore over 200 yards, and the 30-fathom curve is barely 0.2 mile outside of them. The point here is bare, with the tree line about 0.5 mile back.

Point Cabrillo Light* is shown from a white octagonal frame tower on dwelling, and marks the point. The light is 84 feet above the water, and visible 15 miles. The fog signal is sounded on an air diaphone.

From Point Cabrillo, the coast trends northward for about 9 miles to Laguna Point as a nearly straight line of bluffs, with numerous rocks close under the cliffs. It is moderately high, partly wooded to the face of the cliffs, and is broken by several indentations and small streams. The 30-fathom curve is an average distance of 1 mile from shore.

Caspar Anchorage, about a mile northward of Point Cabrillo, is a small cove about 0.3 mile wide, at the head of which is the mouth of **Caspar Creek.** Fair shelter, except from westward, is afforded. The anchorage is contracted, and is used only by coasting steamers when the sawmill is in operation. Steam schooners used to be loaded by means of a wire cable; mooring buoys are placed for warping into position. The village of **Caspar,** which has a post office, is situated on the northern bank of the creek near its mouth. Communication may be had by bus, truck, and telephone. Provisions may be obtained in limited quantities.

To enter, local vessels steer for the slab fire at the mill just open off the northern point at the mouth of the river, course **109°**. This course leads to the moorings. There is a bell buoy about 0.45 mile 230° from **Caspar Point.**

From Caspar Creek to Noyo Anchorage, the coast consists of broken irregular cliffs, 40 to 60 feet high, with numerous rocks extending in some cases 400 yards offshore. These are fairly well fringed by kelp, especially in summer.

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*Lat. 39°20′.9, Long. 123°49′.5: Charts 5602, 5711, 5002, 5052, 9000.

CASPAR POINT TO LAGUNA POINT

(CHART 5703)

Noyo Anchorage, about 5 miles northward of Point Cabrillo, is less than 0.5 mile long and 0.25 mile wide, and while affording fair shelter from northward or southward, is open westward. The anchorage is limited to an area about 0.2 mile long and less than 0.1 mile wide, with depths of 3½ to 7 fathoms. Heavy mooring buoys are placed for vessels to ride-to while loading. This anchorage was used by the lumber company at Fort Bragg until 1939, when the shipment of lumber by water ceased, for loading vessels whose draft was too great to permit of their reaching the Fort Bragg Wharf. Such vessels were generally towed in and out by the local steam schooner, or a pilot was obtained for them. This anchorage is generally used only from about March 1 to November 1.

Noyo River enters at the head of the cove, and the village of **Noyo** is situated on the southern bank of the river near its mouth. The river has been improved by a jetty with a lighted beacon at the outer end, on the northern side of the entrance, and by a dredged channel as far as the highway bridge at Noyo. The project depth is 10 feet; in June 1942, the controlling depth was 4 feet. †In _____ 19___, the controlling depth in the channel was _____. A rock with about 3½ feet over it is reported to have been struck by several fishing boats. Its reported position is near the northern edge of the channel; the rock may have been detached from the jetty. The jetty should be given a berth of 30 yards, passing half way between the jetty and the visible rocks on the southern side of the channel. There is a flat rock near the western edge of the channel with 3 feet over it. It lies about 20 yards northward of the range formed by the jetty light and the southern shore tangent of the river. A bell buoy is located 0.7 mile westward of the jetty light.

The lumber yard and loading station on the northern point at the entrance are prominent from seaward. Supplies may be obtained at Fort Bragg, from which point there is communication by rail, and by telephone and telegraph. The mean range of tide here is about 4 feet.

In entering, the deepest water is found close to the two visible rocks on the southern side of the channel. Give these rocks a berth of about 10 yards, and when the second and largest rock is passed, haul over and favor the jetty. The shoalest water is about 50 yards eastward of the outer end of the jetty. Caution must be used in entering with a draft of 4 feet or more. With a heavy westerly or southwesterly swell there are breakers at the entrance to the Noyo River, so that it is necessary to enter before this condition occurs. Inside the river there is shelter from any condition of wind or sea.

From Noyo River to Fort Bragg Landing, about 0.7 mile, the coast consists of rocky cliffs, 40 to 60 feet high, bordered by rocks and sunken ledges extending 100 to 400 yards offshore.

Fort Bragg Landing about 1 mile northward of Noyo River and 30 miles northward of Point Arena is located in the small cove formerly known as Soldiers Harbor. The cove is 0.4 mile long and 0.2 mile wide, but is contracted by the rocks and ledges extending from both points, and there is no room to anchor. The clear channel leading to the wharf is about 125 yards wide at the entrance between the breakers, and once inside, fair shelter is afforded in northwesterly and southeasterly weather; in westerly

†Date and values to be inserted by the navigator. From data in the latest Supplement or Notice to Mariners.

weather it is wide open. A rocky reef, partly bare at high water, extends southwestward from the northern head and breaks the force of the swell from northwestward.

The town of **Fort Bragg,** the largest coast town between San Francisco and Eureka, is situated near the head of the cove. Vessels may load and discharge at the wharf, which extends 600 feet from the head of the cove to a depth of 20 feet at low water. The bottom on the north side of the wharf is rocky; on the south side, sandy. Mooring buoys are provided and maintained for breasting off from the dock when necessary on account of the swell entering the cove. The wharf and mooring buoys are maintained in condition for almost immediate use. The swell does not interfere with the handling of cargo, which is done entirely from the wharf. Vessels are loaded from both sides of the wharf, but the water is slightly deeper on the northern side, where vessels can be loaded to a draft of 18½ feet. Fort Bragg is on the California Western Railroad which connects with the main line of the Northwestern Pacific Railroad at Willits. The buildings of the town are prominent by day, and the electric lights by night.

There is communication by telegraph and telephone; there is no passenger traffic by water. Provisions and water can be obtained, but no coal. There is a machine shop at the sawmill, where minor repairs to machinery can be made.

Quarantine is enforced in accordance with national regulations. There is also a good private hospital.

Pilots.—Pilots are no longer available.

Storm warnings, plainly visible from the harbor, are displayed by the United States Weather Bureau.

A lighted whistle buoy is moored 0.8 mile 268° from the wharf.

To enter.—From a position 200 yards southward of the lighted whistle buoy, steer 083°, keeping the western gable of the mill in range with a square white bell tower surmounted by a small open cupola. The gable of the mill is not very prominent. This range leads midway between the reefs and to the wharf, but great caution must be used on account of the undertow.

From Fort Bragg Landing to Laguna Point, about 3 miles, the coast is moderately low and rocky, and cut by two small streams; the tree line is within 0.2 mile of the beach.

Laguna Point, 8.5 miles northward of Point Cabrillo, is near the southern end of Ten Mile River Beach. It is a small, projecting cliff, 30 feet high, flat-topped, and bare of trees for 600 yards. It is noticeable only when close inshore. A bare reef extends 300 yards northwestward from the point.

Cleone (Laguna Landing), immediately northward of Laguna Point, is of little commercial importance. It is exposed and only available for small steamers. It affords fair protection in southerly weather, and is occasionally used in winter.

Bald Hill, 810 feet high, lies about 2.5 miles 120° from Laguna Point and is a prominent landmark, its summit and southwestern slope being bare of timber.

LAGUNA POINT TO POINT DELGADA

(CHART 5602)

For about 0.5 mile northward of Laguna Point the bluffs are low, and northward of these a straight sand beach extends for about 3 miles to the mouth of Ten Mile River. The beach is backed by sand dunes for 0.5 mile inland, with the tree line about 1.5 miles from the beach. The California Western Railroad follows close along the beach from Fort Bragg to and up Ten Mile River.

From **Ten Mile River** the coast extends in a general northwesterly direction for about 52 miles to Punta Gorda. This stretch of the coast is particularly bold and rugged, bordered by numerous rocks, and as far as Point Delgada, is heavily timbered. Northward of Point Delgada, the tops of the ridges are generally bare or only partly covered with trees and brush. The cliffs along the shore range from 40 to 100 feet in height. The high, rugged mountains in the vicinity of the coast, which reach elevations of 3,000 to 4,000 feet, are prominent.

Bruhel and **Bells Points** are two small points, 3 and 4.5 miles, respectively, northward of Ten Mile River. They are not noticeable unless close inshore.

Bells Mountain, 0.5 mile eastward of Bells Point, is 1,040 feet high, bare on top, and with a few trees on the ocean side. It is the principal landmark for Westport Landing.

Westport Landing, 12 miles northward of Fort Bragg Landing, is abandoned. It is exposed, and suitable only in summer and in smooth weather. The wharf supporting the cable landing is still in position, but in ruins.

The town of **Westport** is just back of the landing and is a small community dependent on the adjacent farming population for its existence. All shipments, at present (1941) are made by truck. The schoolhouse in a clearing northward and slightly higher than the town, is useful as a landmark. No ship supplies are available.

Gordon Hill, 772 feet high, lies about 6.5 miles northward of Ten Mile River. It is bare to the summit and terminates seaward in **Abalone Point***, 60 feet high, with low, outlying rocks.

Union Landing and **Hardy Creek Landing,** about 0.5 mile apart, near the mouths of **Juan Creek** and **Hardy Creek,** respectively, are 2.5 miles northward of Abalone Point. They were formerly wire-cable landings. The wharf at Hardy Creek is gone; the wharf at Union Creek Landing is only in a fair state of repair, but is fairly prominent. Both landings have been abandoned.

From Abalone Point, the coast trends northwestward for about 4 miles to **Cape Vizcaino,** which is a broad, irregular line of precipitous cliffs, 100 feet high, very broken, and bordered by low rocks, 200 to 300 yards offshore.

A rocky, lime-covered islet, **Island Knob,** 200 yards long and 120 feet high, lies close-to and almost connected with Cape Vizcaino. A breaker lies 275 yards westward and southward from the northwestern point of the islet. **Cottaneva Rock,** 20 feet high, is a small rock about 500 yards southeastward of Island Knob, and 275 yards offshore. Several smaller rocks lie inside of it, and two others about 160 yards northwestward.

Rockport (Cottaneva) Cove, lies about 0.5 mile northward of Cape Vizcaino. The shelter is poor. It was formerly used as a cable landing for loading lumber; a long cableway extended from a 150-foot tower on shore to the largest of a group of rocks in the northern part of the cove. The towers and overhead cableway are maintained in good condition. A new sawmill was built in the narrow Cottaneva Valley, which opens on the seashore and forms an outlet for a vast amount of standing redwood timber. The mill is in operation, but all lumber is handled by truck at present (1941).

A pinnacle rock, having 3 fathoms over it, lies 300 yards southwestward of the landing rock. Enter on an easterly course; Island Knob, south of the cove, is an excellent landmark, as are the two large wooden towers at the extremities of the cableway.

Cahto Mountain, 4,231 feet high, is about 11.5 miles eastward of Cape Vizcaino, and in clear weather is a prominent landmark.

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*Lat. 39°40′.0. Long. 123°47′.6: Chart 5602.

Between Cape Vizcaino and Point Delgada are several, small exposed landings available for use only in the summer and in smooth weather. These landings ship ties, tanbark, and shingles, and then only when they can be handled at a profit, and the landings are abandoned or revived, according to the commercial demands. Wire cables are used in loading and discharging, mooring buoys being placed where necessary. Supplies are not obtainable and communication is irregular. The principal landings are **Monroe Landing, Usal,** and Needle Rock. None of these have been used for many years. All traffic is handled by truck.

Double Cone Rock, lies 3.5 miles northward of Cape Vizcaino, and 300 yards offshore.

Usal Rock, about 5.5 miles northward of Cape Vizcaino, is 45 feet high and black in color. It lies 200 yards off a small point of rocks.

The mouth of **Usal Valley** lies about a mile northward of Usal Rock, and is a narrow, steep gulch, in front of which is a small area of flat land with a low beach. A small grassy hillock is just inside the gulch. The view up the valley is open for a very short time while passing.

Big White Rock, 95 feet high, lies about 2 miles northward of Usal Valley, and 125 yards offshore from the steep cliffs, which are bordered by numerous rocks. This rock is a prominent feature when the higher points of the land are in fog.

Anderson Cliff, about 2 miles northward of Big White Rock, is a projecting rocky spur, 715 feet high, with one large rock and numerous smaller ones close inshore.

Cluster Cone Rock, a prominent 68-foot pinnacle, is the largest and whitest of a small cluster of 6 high rocks, 200 yards offshore, lying about 4.8 miles northward of Big White Rock.

Morgan Rock, a large white-topped, block-shaped rock, 57 feet high, and about 0.5 mile northwestward of Cluster Cone Rock, shows prominently. It is the largest of a group of rocks extending some 200 yards from a high rocky cliff and is particularly valuable as a landmark when higher land is covered by fog.

Bear Harbor Ridge, a detached coastal ridge, about a mile northwestward of Cluster Cone Rock, has two peaks, the southern one, 375 feet high, being the higher. It is the most prominent feature in this vicinity when viewed from the northwestward. The seaward face of the ridge is marked with steep, loose slides.

Needle Rock, 46 feet high, is 2 miles northward of Morgan Rock; the rock blends into the bluff from offshore. There are a group of old mill buildings, a few houses, and an old landing platform about midway up the flat marking the abandoned Needle Rock Landing.

Small White Rock, 37 feet high, lies 5 miles northward of Cluster Cone Rock and 4 miles southward of Point Delgada. It is close inshore and just outside the low-water beach; once identified this rock makes a valuable landmark.

From a little below Small White Rock to Point Delgada, the country is not timbered but is covered with dense, low brush, which presents a uniform dark-green appearance.

A submarine ridge, known as the **Tolo Bank,** extends southward from Point Delgada for about 7 miles. The depths are quite irregular, the least found being 9 fathoms. The area was swept with wire drag in 1936 to a depth of 47 to 50 feet and no dangers of less depth than 9 fathoms were found. No kelp was found on the bank at any time during the summers of 1935 and 1936.

Caution.—The area just south of Shelter Cove is subject to slides which might deposit rocks along the shores. Even small vessels should approach the shore with care.

SHELTER COVE

(CHART 5773)

Point Delgada* lies about 66 miles northward of Point Arena, and nearly 20 miles southward of Punta Gorda. It is a cliff-faced plateau making out about a mile from the general trend of the coast. The seaward face of the plateau is a mile long and bordered by numerous rocks. A fog signal (bell) is operated from a small white skeleton tower on the easterly end of the point. A lighted whistle buoy is moored 1.1 miles southwestward from the point.

Shelter Cove lies under the southern face of Point Delgada, and affords fair shelter in northwesterly weather, but is exposed and dangerous with southerly or westerly winds. There is nearly always a swell runnning. The wharf in the western part of the cove is in ruins (1941).

Shelter Cove is extensively used as an anchorage by a large fishing fleet. A good dirt and gravel road is kept open in all but the worst weather; there are telephone facilities. Two pinnacle rocks close together, with 2½ fathoms over then, lie a little over 0.5 mile 154° from the point. These are usually well marked by kelp. A rock, with 1¼ fathoms over it, lies a little over 0.25 mile 143° from the point. This also is usually well marked by kelp.

The following directions lead over an area covered by the wire drag: From a position 100 yards southward of Point Delgada lighted whistle buoy, steer **110°** for 0.9 mile; then steer **016½°** for 1 mile and anchor in 9½ fathoms, with the bell tower bearing 315½°, distant 0.7 mile. The 2½ and 2¾-fathom spots are within 500 yards to the westward of this anchorage. The 3¼-fathom spot lying 1.15 miles 184°, and the 3½-fathom spot 0.85 mile 201° from the bell tower, will be avoided if a careful course is steered.

POINT DELGADA TO PUNTA GORDA

(CHART 5602)

From Point Delgada, the coast extends west-northwestward for about 19 miles to Punta Gorda, backed by steep mountains covered with chaparral and trees. About 0.8 mile northward of Point Delgada, there is a sand beach that extends northward for 4 miles. **Kaluna Cliff,** 1,474 feet high, overlooks the southern end of the sand beach and its steep face, scarred by frequent slides, is a noticeable landmark.

King Peak, 4,090 feet high, the highest of three, is the well-known landfall generally called Three Peaks. It lies about 8.5 miles northward of Point Delgada, 2.5 miles from the coast, and in clear weather is visible seaward for about 75 miles.

About 6 miles northward from Point Delgada is the head of **Delgada Canyon,** a submarine valley, the 100-fathom curve lying within 0.5 mile of the beach. This valley extends in a northerly direction, with an average width of 1 mile between the 100-fathom curves for 3.5 miles, and then expands, funnel-shaped, for 3 miles more. Over 400 fathoms are found at its mouth, and 300 fathoms within 4 miles of the beach. The side slopes are steep.

Big Flat is a narrow strip of low, flat land about 7 miles westward of Point Delgada. It is 2 miles long and is bordered by sand beaches. Some ranch houses and barns are located at the southern end of the flat. **Shubrick Rock,** low and small, lies 300 yards off the southern end.

*Lat. 40°01′.8, Long. 124°03′.8: Charts 5602, 5773.

About 11.5 miles northward of Point Delgada is the head of **Spanish Canyon,** a submarine valley. The 100-fathom curve lies within 2 miles of the shore.

About 5 miles northward of Big Flat is the broken bow of the ship *Daisy Putnam.* This part of the wreck is made of heavy timbers and is deeply buried in the sand between high and low water.

Reynolds Rock, 10 feet high, lies about 6.5 miles westward of Big Flat. It is about 550 yards offshore, and when seen from close inshore appears as a double-headed rock, over which the swell breaks in nearly all weather.

Rodgers Break is a sunken rock, with ½ fathom over it, 0.5 mile westward of Reynolds Rock. It lies about 4 miles southeastward of Gorda Rock and 6.8 miles west-northwestward of Big Flat. It is a pinnacle rock that seldom breaks; the top is occasionally seen in a heavy swell. Rodgers Break and the 3-fathom pinnacle 0.5 mile to the northwestward, are the outermost known dangers on this stretch of the coast. Rodgers Break is marked by a lighted whistle buoy. A pinnacle rock with 3 fathoms over it lies about 0.5 mile northwestward of Rodgers Break and about the same distance offshore. This probably breaks in very heavy weather.

From Reynolds Rock northwestward to Punta Gorda, the shore is bordered by numerous rocks extending about 0.3 mile offshore. The sharp depression in the hills near the coast, caused by the gulch of **Cooskie Creek,** 3.5 miles southward of Punta Gorda, is sometimes useful in dark nights to vessels close inshore in making the point from southward.

PUNTA GORDA TO FALSE CAPE

(CHART 5795)

Punta Gorda is a high, bold, rounding cape, about 83.5 miles northwestward of Point Arena and 11 miles southward of Cape Mendocino. The seaward face rises to 800 or 900 feet, 400 yards back from the beach, and terminates in a spur, 140 feet high, almost overhanging the sea. It is bare of trees except in the gulches. For over 1.5 miles northward and about 2 miles southward of the point, the beach is bordered by numerous rocks and shoals extending in some cases 0.6 mile offshore.

The wind, sea, and currents off Punta Gorda are probably as strong as off any point on the coast; frequent and strong tide rips have been noted. Many times when the weather at Shelter Cove and even at Big Flat is clear and calm and sea smooth, both the wind and the sea will pick up as Punta Gorda is approached, until just northward of this point strong breezes to moderate gales will be experienced. At other times clear weather southward of this point will lead to fog northward, or vice versa.

Punta Gorda Light* is shown from a gray rectangular structure. The light is 75 feet above the water, and visible 14 miles. A fog signal is sounded on an air siren.

Gorda Rock, 10 feet high, is a conical rock a little over 0.7 mile southward of Punta Gorda and 0.6 mile offshore.

Conical Rock, 20 feet high, lies 200 yards off the point. A small, low rock lies 350 yards westward from it, with foul ground between.

From Punta Gorda to Cape Mendocino, the hills back of the coast are lower than those southward; they are bare of trees and bordered by stretches of low, narrow, sandy flats with a narrow, low-water beach. The outlying rocks are not over 0.7 mile offshore until within 1.5 miles of Cape Mendocino, where they extend farther and terminate in

*Lat. 40°15.′0, Long. 124°21.′0: Charts 5602, 5795, 5002, 5052, 9000.

Blunts Reef, 2.5 miles broad off the cape. At 3 miles northward of Punta Gorda, **Mattole Canyon,** a narrow submarine valley, makes in, with 100 fathoms a little over 1 mile from the beach. **Mendocino Canyon** makes in 4.5 miles southward of Cape Mendocino, with 100 fathoms 2 miles from the beach.

Christmas Rock, with a depth of 1¼ fathoms over it, lies 1.8 miles 321½° from Punta Gorda Light.

The **Mattole River** enters 2 miles northward of Punta Gorda. This river is not navigable and cannot be entered with a small boat at any stage of the tide. The northern head is bare and about 360 feet high, and the southern head is about the same height and partially covered with oak trees. A prominent sand dune is on the southern side at the entrance to the valley. Another large sand dune about 3.5 miles to the northward, marks the northern side of **McNutt Gulch** and should not be confused with the one at Mattole River.

Mattole Point lies about 0.3 mile northward of the river, at the base of **Moore Hill,** 1,210 feet high. There is a rock, 8 feet high, 0.3 mile northward of Mattole Point and 250 yards off the beach at the head of Mattole Canyon. This rock was formerly used to support the end of a wharf.

A rock with ½ fathom lies 0.4 mile 328° from Mattole Point.

Sea Lion Rock, 16 feet high, is the largest of a cluster of small rocks 0.5 mile offshore and nearly 4 miles northward of Punta Gorda.

The Brothers, 8 feet high, consists of two small rocks, close together, 800 yards offshore, and 0.5 mile northward of Sea Lion Rock.

Devils Gate Rock, 20 feet high, lies nearly 2.8 miles southward of Cape Mendocino and 0.5 mile offshore. It is low and pyramidal, with a smaller rock close under the northwestern face. A reef extends 200 yards westward from the rock; numerous rocks lie inshore. A rocky shoal of 3¾ fathoms lies about 1.4 miles westward of Devils Gate Rock.

Outer Break, which bares 1 foot at MLLW, lies 1.15 miles 316° from Devils Gate Rock.

Steamboat Rock, 30 feet high, lies 1.5 miles southward of Cape Mendocino and 600 yards offshore. The upper part of the rock is white and the lower black, somewhat resembling a steamer with a low black hull and white upper works.

Cape Mendocino is a mountainous headland, the famous landmark of the old Spanish navigators and the galleons from the Indies. The cape is the turning point for nearly all vessels bound northward or southward. In view of the dangers in the vicinity, it should be approached with considerable caution in thick weather; the bottom and the currents are very irregular. It is in the latitude of great climatic change; the meteorological conditions northward of the cape are quite different from those southward. The winds do not blow home so violently in the bight southward of it, and the amount of rainfall increases rapidly to the northward. Fog is more prevalent southward. The strong northwesterly winds of summer are less violent southward of the cape, which forms a partial lee for vessels working their way northward.

The seaward face of Cape Mendocino is steep, rocky, and waterworn toward the shoreline. Above the light, the general appearance is rolling and grass-covered, except in the deep ravines and upon some of the steep hillsides where the northern exposure is covered with forest or brush. For about 3 miles southward of the cape, the beach is bordered by numerous rocks and sunken ledges, extending in some cases to over 0.5 mile offshore.

Cape Mendocino Light is shown from a white pyramidal tower situated on one of the western spurs about 400 feet above the sea. The light is 422 feet above the water, and is visible 28 miles.

Sugar Loaf, 326 feet high, lies 250 yards westward of Cape Mendocino and is connected with it at low water by a narrow neck of rocks, and shingle beach. This rock is a prominent feature in making the cape from either northward or southward, but in thick or hazy weather care should be taken to avoid mistaking it for False Cape Rock, which it somewhat resembles, that lies in a similar position off False Cape, 4.5 miles northward of Cape Mendocino. False Cape Rock is about 216 feet high and is not so regular in outline as the Sugar Loaf, and from the westward or northwestward, shows two large rocks, 90 and 46 feet high, immediately inside of it, whereas the Sugar Loaf stands solitary and compact. As seen from the southwestward, Sugar Loaf shows a cave on its southwestern face, extending about ⅓ the height of the rock.

Blunts Reef is one of the outermost visible dangers off Cape Mendocino. It consists of two small, black rocks, awash at high tides, about 230 yards apart with 15 fathoms between. The southern and outer rock lies 2.6 miles 283° from the Sugar Loaf Rock. This is the larger of the two rocks.

Blunts Reef Lightship* is moored in 27 fathoms 1.9 miles southwestward of the outer rock. It has a red hull with BLUNTS on each side and two masts with a circular grating at each masthead. The lights shown from each masthead, are 65 feet above the water and visible 14 miles. The fog signal is sounded on a two-tone air diaphone; if diaphone is disabled, the signal will be given on a bell struck by hand. A fixed white riding light is shown on the forestay. A radio equipped for distance finding is maintained. The station receives and sends radio emergency messages only.

The currents at the lightship are described on page 33.

An area about 1.5 miles long in an easterly direction, having rocky patches from 4½ to 5¾ fathoms, lies about 3 miles northwestward of Blunts Reef.

Fauntleroy Rock, with ¾ fathom over it, lies 1.65 miles 251° from Cape Mendocino Light.

A rock, with 1¾ fathoms over it, lies 0.5 mile 162° from the outer rock of Blunts Reef. The **Great Break,** with 3¾ fathoms over it, lies 0.75 mile 188° from the outer rock of Blunts Reef.

Eastward of Blunts Reef and the Great Break are a number of dangerous rocks and sunken ledges, a detailed description of which is unnecessary. Vessels should not attempt the passage between Blunts Reef and the cape under any circumstances. A heavy westerly swell breaks even in 9 to 10 fathoms in this locality.

From Cape Mendocino to False Cape, a distance of 4.5 miles, the coast is straight and bold, and bordered by a broad, low-water beach.

Bear River, a small stream, enters through a narrow valley about midway between the two capes.

False Cape is a steep, bold headland, rising to a height of over 600 feet in less than 0.2 mile from the beach; it projects but little from the general trend of the coast. It is covered with grass, but the gulches on its sides are wooded. The base of the cape is bordered by a narrow, low-water beach of shingle and sand. For about a mile on each side of the cape are numerous rocks and ledges which do not extend over 0.5 mile from the beach.

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*Lat. 40°25′.9, Long. 124°30′.3: Charts 5602, 5795, 5002, 5052, 9000.

False Cape Rock, 216 feet high, lies 0.4 miles westward of the cape, with two rocky islets, 95 and 54 feet high, between. It is not as regularly-shaped nor as high as the Sugar Loaf off Cape Mendocino, and the top is much flatter. A rock, with 1¾ fathoms over it, lies a little over 0.5 mile westward of False Cape Rock.

Mussel Rock, 7 feet high, is 0.8 mile northward of False Cape Rock.

FALSE CAPE TO TABLE BLUFF

(CHART 5602)

Northward of False Cape, the hills decrease in height, and 4 miles beyond the cape is the beginning of a stretch of sand beach and dunes, broken only by Table and Red Bluffs that extend to Trinidad Head.

Centerville, about 4 miles northward of False Cape, is not prominent from seaward. There are 2 or 3 houses on the beach to the northward of the bluffs and hills, but they are partially hidden by the hills when viewed from the southwestward. There is a conspicuous white cross on the 120-foot bluff just southward of Centerville.

Eel River empties nearly 9.5 miles northward from False Cape. This is a stream of considerable size and is occasionally entered by light-draft vessels, but the channel over the bar is continually shifting. The depth on the bar varies largely with the amount of water in the river, depending upon the character of the winter, and has been at times as much as 14 feet, but generally the depth is about 8 or 9 feet. The river is seldom entered except by fishing boats and other very small craft, and then only by those with local knowledge of the bar.

Eel Canyon is a submarine valley extending in a northwesterly direction. It comes to a head 10 miles northwestward of Cape Mendocino. Vessels are cautioned against mistaking this valley for one of those southward of the cape.

HUMBOLDT BAY

(CHART 5832)

Table Bluff, about 12 miles northward of False Cape and 4.5 miles southward of Humboldt Bay entrance, is a prominent feature from seaward. The western face is 0.5 mile long, 165 feet high, very steep, and has a narrow sand beach under it.

The radio tower and elevated tank at Table Bluff are prominent.

Table Bluff Light is shown from a white tower on a dwelling near the extreme western edge of the bluff. The light is 176 feet above the water, and is visible 20 miles. The fog signal is sounded on an air diaphone. The fog signal sounds five or six short, sharp blasts followed by a blast of 15 seconds duration to warn the Coast Guard crew when vessels are in distress; siren is used if diaphone is disabled.

A radio direction-finder station is located at Table Bluff Light.

From Table Bluff to **Humboldt Bay entrance,** the coast consists of a narrow sand spit for 4 miles, behind which lies the southern part of Humboldt Bay.

Humboldt Bay is the first important harbor northward of San Francisco. The entrance is 21 miles northward of Cape Mendocino Light. A large amount of lumber is shipped to both foreign and domestic ports; considerable quantities of farm and dairy produce, livestock, leather, and fish are also shipped, mostly to San Francisco. General merchandise, fuel oil, and coal are received.

Since the improvements by the Government, the bay can be used as a harbor of

refuge in impending bad weather, provided it can be made before the bar becomes impassable.

The bay consists of two shallow basins connected by a narrow channel about 5 miles long, the entrance to the bay being at the junction of this channel with the southern basin.

Prominent features.—Table Bluff Light*, 4 miles southward of the entrance, is the best landmark by night. By day, the smoke from the sawmills in the bay can usually be seen. The light on the southern jetty is placed on a steel mast. Humboldt Bay fog signal station is situated on the tank near the bay end of the northern spit.

The red bluff at **Buhne Point** is abreast the entrance on the eastern shore of Humboldt Bay and is a conspicuous feature from seaward because of its color and elevation. While only 100 feet high, it is prominent on account of the surrounding lowland, and in a low-lying haze frequently resembles an island.

A **Coast Guard station** is located inside the northern spit, about 0.5 mile northward from the end. A lookout tower is located on the seaward side of the spit, abreast the station. Storm warnings are displayed and signals to ships by flashing lights and International Code are made on the mast 25 yards southward of the lookout tower.

The approach to the bay is marked by a lighted whistle buoy moored 1.25 miles westward of the end of the southern jetty. The outer bar bell buoy is located 0.5 mile westward of the same point. A light is located on the southern jetty, 165 yards from its outer end.

The **Humboldt Bar** has been improved by the Government by the construction of two jetties 750 yards apart. The southern jetty extends northwestward a distance of 0.7 mile from the northwestern point of the southern spit; the northern jetty is even with the southern jetty. Prior to the construction of the jetties, this bar was never crossed by the local pilots, as it was subject to considerable shifting and shoaling at times, especially during the winter months. For this reason there are no range marks established and the buoys are frequently shifted. The channel used is around the outer end of the southern jetty. The local pilots keep careful watch over the bar conditions, and often sound out the channel before attempting to take out deep-draft vessels. Due to conditions of the inside channel as well as the bar, 21.5 feet is the usual maximum draft to which vessels are loaded in Humboldt Bay.

In the past, Humboldt Bar was considered treacherous and dangerous, and many disasters have occurred here. With the present improvements, however, and by employing local pilots, vessels may enter or leave with comparative safety. The strong currents that may be encountered, and the abrupt turn at the outer end of the southern jetty are apt to be dangerous for strangers. The bar is smoothest during the last of the flood tide, and it is often passable at this time and impassable two hours later, when the ebb tide has set in.

Within the jetties is an area of rapid changes which must be navigated with great caution. From within the jetties the channel curves northward and passes close under the eastern point of the northern spit, then continues northward for 3.2 miles to the entrance of the northern basin. Here it divides into three branches, the eastern one called the **Eureka Channel,** passing along the waterfront of Eureka, the middle one between Gunther and Woodley Islands, and the western and largest one between the northern spit and Gunther Island. The western channel divides into Mad River and

*Lat. 40° 41′.7, Long. 124° 16′.4: Charts 5602, 5832, 5002, 5052, 9000.

Arcata Channels immediately northward of Gunther Island; the eastern channel connects with **Eureka Slough.**

Channels.—The project is as follows: an entrance channel 30 feet deep; a channel 26 feet deep from deep water in Humboldt Bay to the foot of N Street, Eureka; a channel 26 feet deep across Gunther Island Shoal to Samoa; a channel 18 feet deep to Arcata Wharf; a channel (Hookton) 26 feet deep to Fields Landing, with a turning basin 600 feet wide and 800 feet long off the Fields Landing Wharf.

In June 1942, the controlling depths were as follows: Channel across the bar, 24 feet; entrance channel between the jetties, 30 feet for a least width of 450 feet adjacent to the southern jetty; Eureka Channel, 20 feet; Samoa Channel, 27 feet; Hookton Channel, 23 feet at the extreme northern end, thence 26 feet to Fields Landing, with 25 feet in the turning basin. In May 1937, the controlling depth in the Arcata Channel was 18 feet to the seaward end of the Arcata Wharf; thence it shoaled to about 13 feet at the end of the channel.

†In_____19__, the controlling depths in the channel were:_____

_____

_____

_____

The northern basin, **Arcata Bay,** is about 3 miles in diameter, with low, marshy shores, cut by many sloughs. There are two channels, the **Mad River Slough Channel,** leading into **Mad River Slough,** and the **Arcata Channel,** leading to the railroad wharf, now in ruins, at Arcata. The former is now abandoned. The latter channel is marked by beacons. **Gunther** (formerly **Indian**), **Woodley,** and **Daby Islands,** low and marshy, lie in the entrance to the northern basin.

Along the eastern shore of the bay, northward to Eureka, are several sawmills, with docks built out to the channel, from which lumber is shipped.

Rolph is a small town on the western shore 2 miles southward of Samoa. There is a large wooden shipyard here, but it was not in operation (1941).

Eureka, the principal town on the bay, is situated on the eastern shore, about 4 miles northward of the entrance. It handles most of the water-borne traffic of the bay, and is the terminus of a railroad from San Francisco, although a branch of the road continues to Arcata, Samoa, and Trinidad.

The approach to Eureka from the main channel through the bay is through an almost straight natural channel, which has been improved by dredging.

Samoa, on the western shore opposite Eureka, is the terminus of a railroad from Arcata. There are large sawmills here, and a considerable amount of lumber is shipped. There is a least depth of 26 feet in the channel leading to Samoa, and 20 feet alongside the docks. The high concrete stack with black rings at the top, is prominent from offshore. There are 3 tanks, white with black rings, westward of the stack, and 2 similar tanks to southward. There is regular ferry service between Samoa and Eureka.

Arcata is situated on the northern shore of the northern basin. There are no serviceable wharves in Arcata. One wharf near the head of **Arcata Channel**, is almost in ruins except the outer end, where there are a building and a tank which appear to be in fair condition. A second wharf, 0.4 mile eastward of the **Arcata Wharf,** is also in ruins. The rock for the jetties, which was formerly shipped from this wharf, is now shipped direct to the northern jetty by rail. Arcata Channel is well marked by beacons.

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

The southern basin is about 3 miles long and 2 miles wide. There are two channels, one leading toward **Southport Landing,** the other past Fields Landing to **Hookton,** at the head of **Hookton Slough.** The **Southport Channel** has a least depth of 6 feet, but is little used. The **Hookton Channel** to Fields Landing is marked by beacons and buoys. The northern entrance to this channel changes as frequently as the bar and difficulty is sometimes experienced in getting the lumber schooners in and out.

Fields Landing, on the eastern shore of the southern basin, is reached by the Hookton Channel. There is a large sawmill here and considerable lumber is shipped. There are depths of 18 to 20 feet alongside the loading wharf. Fields Landing is on the railroad and highway.

Pilots and towboats.—Pilots and towboats are available. Vessels desiring their services should radio ahead to the Humboldt Stevedoring Company at Eureka. Pilots may also be obtained by making a flag signal to the Coast Guard station accompanied by three blasts of the whistle. The master of the towboat acts as pilot. The towboat is rated at 700 horsepower, and is well equipped for bar work.

Towage charges for light vessels inward, and loaded vessels outward, or vice versa, are 60 cents per 1,000 feet lumber cargo, and 15 cents per ton general cargo.

Pilotage rates vary from $50 (in and out) for a vessel under 500 gross tons, to $350 for a tramp steamer (in and out and moves between docks).

Quarantine.—Regulations of the United States Public Health Service are enforced. The quarantine station is located at 507 F Street.

Eureka is a port of entry and marine documents are issued. The Bureau of Customs is in the Federal Building.

The **Immigration Service** office is in the Federal Building at Eureka.

Marine hospital.—A relief station of the United States Public Health Service, in charge of a service officer, is located at Eureka.

There is a **chart agency** of the U. S. Coast and Geodetic Survey situated here.

Anchorage.—The best anchorage is from a point about 0.2 mile northward of the buoy abreast Bucksport Wharf to the post light marking the entrance to the channel leading to the waterfront at Eureka. Vessels in anchoring must keep clear of the cable crossing the channel from a little below the post light on Brosnon's Wharf to the western shore. It is forbidden to anchor in Eureka Channel longer than 24 hours at a time. If obliged to anchor outside the bar, the best anchorage will be found a little southward and westward of the lighted whistle buoy in about 90 feet, sand and clay bottom; anchors as a rule are hard to break out.

Harbor regulations are prescribed by the Board of Harbor Commissioners, and are enforced by the surveyor of port.

Tides.—The mean range of tide at Eureka is 4.8 feet. The range between mean lower low water and mean higher high water is 6.7 feet. A range of about 11 feet may occur at the time of maximum tides. Daily predictions for Humboldt Bay (South Jetty Landing) are given in the Tide Tables published annually in advance by the United States Coast and Geodetic Survey.

Currents.—The tidal currents follow the general direction of the channels. In the main channel, the average velocity at strength is less than 2 knots, and the maximum does not exceed 3 knots. Between the jetties, the average velocity at strength is about 2 knots, with a maximum of about 4 knots.

DIRECTIONS, HUMBOLDT BAY

A pilot should be engaged by strangers if there is any sea on the bar or if they have deep-draft vessels. It should be borne in mind that the bar is subject to change, so that strangers cannot rely on finding the charts correct or the buoys indicating the best water.

From southward.—From a position 1.5 miles 260° from Blunts Reef Lightship, position 4, table 4 on page 45, a **030°** course made good for 23.5 miles leads to Humboldt Outside Bar Lighted Whistle Buoy. At night Table Bluff Light should be made shortly after passing Blunts Reef Lightship, and when nearing the entrance, the lights in Eureka will be seen. In thick weather, after passing False Cape Rock, all dangers will be cleared by keeping in a depth of over 15 fathoms until up with the lighted whistle buoy, where anchorage should be made until a pilot is obtained.

From northward.—From a position 3 miles westward of Trinidad Head Light, a **187°** course, made good for 17 miles, leads to the lighted whistle buoy. On this course Table Bluff Light, 5 miles southward of the lighted whistle buoy, should be made ahead. In thick weather, the depths should not be shoaled to less than 20 fathoms between Turtle Rocks and Trinidad Head, and when southward of the head, the depths should not be shoaled to less than 15 fathoms until up with the lighted whistle buoy, where a vessel should anchor until a pilot is obtained.

From seaward.—Vessels can stand in boldly until sure of their position, when the course should be shaped for the entrance. In clear weather, the high land of Cape Mendocino and Punta Gorda southward, and Trinidad Head northward of the entrance, are good landmarks. At night, the lights are a good guide. In thick weather soundings should be taken frequently, and upon getting depths of 30 fathoms or less great caution must be exercised until sure of the vessel's position.

Sailing vessels during the prevailing northwesterly winds of summer should endeavor to make the land in the vicinity of Trinidad Head, which gives them a fair slant for the entrance, and is an additional precaution against the irregular southerly set of the current. In thick weather, soundings should be taken constantly when inside of 50 fathoms. Making the land northward of the entrance avoids the irregular bottom and dangerous currents in the vicinity of Cape Mendocino.

From the lighted whistle buoy: Due to the frequent changes in the entrance, no directions of permanent value can be given. The latest chart and the buoys are the guides. Once inside the bay, the channels are well marked by beacons and buoys, and are easy to follow.

Supplies.—Fuel oils, provisions, water, and ship chandler's stores can be obtained at Eureka. Coal can be had in limited quantities only.

Repairs.—Minor repairs to machinery and to woodwork above water can be made. There are no drydocks nor marine railways.

Communication is by rail to San Francisco, and by regular lines of steamers plying between Columbia River, Coos Bay, Humboldt Bay, and San Francisco. There is also considerable irregular traffic in large launches to various local points to the north and south. Communication is available by telegraph and telephone or by commercial radio at Eureka.

Storm warnings are displayed by the United States Weather Bureau from the roof of the Federal Building, Eureka, plainly visible from the anchorage, and also at Humboldt Bay Coast Guard Station at the northern jetty.

HUMBOLDT BAY TO TRINIDAD HARBOR

(CHART 5602)

Northward of the entrance to Humboldt Bay, the coast consists of sand dunes partly covered with timber for 11 miles to the mouth of **Mad River,** and for the first 7 miles forms the western shore of Humboldt Bay. Above the bay the land behind the dunes is low and marshy as far as the river.

From the mouth of Mad River, the sand dunes, varying in height from 20 to 60 feet, continue for about 5.5 miles to **Little River,** a small shallow stream. The northern point at the mouth of the stream is rocky, and from this point the coast consists of rocky cliffs extending beyond Trinidad Head.

TRINIDAD HARBOR

(CHART 5846)

Little River Rock, 126 feet high, lies 0.8 mile northwestward of the mouth of Little River, and about 0.3 mile offshore. Several rocks and foul ground lie between it and the beach, and a rock, 4 feet high, lies about 100 yards northwestward.

From Little River Rock to Trinidad Head the shore is bordered by numerous rocks and sunken ledges, extending 0.3 mile offshore.

Pilot Rock, 93 feet high, lies 0.5 mile southward of Trinidad Head. It is of small extent, conical, and whitish in color, rising abruptly from depths of 48 to 59 feet on all sides.

Trinidad Head lies nearly 39 miles northward of Cape Mendocino, and 17.5 miles northward of the entrance to Humboldt Bay. It covers an area 700 yards long and 500 yards wide, and rises to a height of 380 feet. The sides are steep and covered with chaparral. From northward or southward, the head is generally raised as a dark, round-topped island. Near the northern end it is joined to the mainland by a narrow neck, from the southern side of which **Little Head,** a rocky knoll 125 feet high, projects into the bay. There is an almost black cross on Trinidad Head which is not very prominent. The old tank platform about 200 yards northward of the cross, is prominent from the westward and eastward.

Trinidad Head Light* is situated near the southwest side of the head on a white pyramidal tower. The light is 196 feet above the water, and visible 20 miles. A fog signal is sounded on a bell; this signal is not sounded from December 1 to April 1 of each year.

Trinidad Harbor is the small cove lying eastward of Trinidad Head. It affords shelter in northwesterly weather but is dangerous in westerly or southerly weather. The cove is small and is further contracted by several rocks, and as a rule, there is always a swell even in northerly weather and the holding ground is only fair. There is no wharf, and the bay is of no commercial importance at present.

Trinidad is a village on the northern shore of the cove. It is on the Redwood Highway, which parallels this section of the coast. There is a hotel in Trinidad and telephone and bus service. Provisions may be had in small quantities.

Prisoner Rock, 42 feet high, is the most prominent of the rocks in the cove, and consists of two rocks so close together that they are usually taken for one. From southward they resemble an animal lying down with its head toward the west. It

*Lat. 41°03′.1, Long. 124°09′.0: Charts 5602, 5702, 5002, 5052, 9000.

lies 220 yards eastward from the eastern shore of the head. A rock with 7 feet over it lies 150 yards north-northwestward from it.

Flat Rock, low and small, lies 350 yards northeastward from Prisoner Rock; a rock with 5 feet over it lies 150 yards southeastward from it. Another rock with 9 feet over it, lies 400 yards 142° from Prisoner Rock.

The best anchorage is in 42 feet, muddy bottom, about halfway between Prisoner Rock and Trinidad Head, with Flat Rock, bearing 73°, just open southward of Prisoner Rock.

In entering from southward, vessels should not pass eastward of the line with the west tangent of Prisoner Rock on range with Little Head, to avoid the 9-foot spot southward of Prisoner Rock. Pilot Rock may be passed close-to on either hand. From northward, after passing Cone Rock, 3.8 miles northward of the light, the coast should be given a berth of not less than 1.3 miles, until the light bears 93°, when the course can be changed to **098°.** This passes about 250 yards southward of the 15-foot spot and rock awash southward of Blank Rock. The southern face of the head may be kept close aboard.

Blank Rock, 111 feet high, lies a little over 0.3 mile westward of the head. There is foul ground between it and the head. A smaller rock lies 150 yards northward of Blank Rock. A rock awash and a ledge with 15 feet over it lie 275 yards southeastward of Blank Rock.

Off-Trinidad Rock, 72 feet high, lies 0.3 miles northwestward of Blank Rock. It is considerably larger than Blank Rock, with two rocky heads of about the same height. A sunken rock lies 300 yards off its southwestern face, and numerous ledges extend southeastward toward the head.

Chapter 10.—TRINIDAD HEAD TO CAPE BLANCO

(CHART 5702)

From Trinidad Head to Rocky Point, 5.5 miles, the coast is rocky, with numerous outlying, rocky islets, and sunken ledges; these, however, do not extend over a mile offshore. Above Rocky Point, the beach is low and sandy, with several lagoons behind it, for nearly 11 miles to the southern end of the Gold Bluffs. From this point to Point St. George the coast is rocky, the cliffs being from 100 to 500 feet in height and bordered by numerous rocks. The Klamath River breaks through the cliffs 16 miles southward of Point St. George. From Point St. George to Cape Blanco, a distance of about 60 miles, the coast trends in a general northwesterly direction, with a shallow bight, Pelican Bay, immediately northward of Point St. George. The beach is fringed by numerous rocks and sunken ledges, but, with the exception of Rogue River and Orford Reefs, these in general do not extend over a mile from shore. The 30-fathom curve follows the general trend of the coast, and in thick weather may be considered as the limit inside of which it is unsafe to approach, but in the vicinity of Rogue River and Orford Reefs, the depths should not be shoaled to less than 50 fathoms.

TRINIDAD HEAD TO POINT ST. GEORGE

(CHART 5702)

From Trinidad Head to Rocky Point, a distance of 5.5 miles, the coast is rugged and rocky, the cliffs reaching elevations of over 100 feet. Rocks and sunken ledges extend, in some cases, over a mile offshore. The mountains back of Trinidad Head are good landmarks for vessels approaching from seaward.

Rodgers Mountain, 3,012 feet high and heavily wooded, lies nearly 7 miles northeastward of Rocky Point, and is easily made out. **Hupa Mountain,** 4,050 feet high, lies farther inland, about 16 miles eastward of Rocky Point.

Green Rock, 108 feet high and of small extent, lies 1.5 miles northward of Trinidad Head and nearly 600 yards offshore. The top is covered with grass. Numerous rocks lie inshore, and a rock awash at high water, lies 700 yards 275° from it. A rock with 3 fathoms over it lies about 0.5 mile 267° from Green Rock. It seldom breaks, and rises abruptly from 15 fathoms. Two sunken rocks lie 0.5 and 0.8 mile 329° from Green Rock.

White Rock, 118 feet high, lies 1.9 miles northward of Trinidad Head. It is of small extent and lies 250 yards off a wooded, projecting head of about the same height. Another rocky islet, 129 feet high, lies 1 mile northward of White Rock.

Cone Rock, 17 feet high, lies 3.8 miles northward of Trinidad Head and a little over a mile offshore. It is conical in shape and of small extent. A smaller rock, 15 feet high, lies 0.5 mile eastward.

Turtle Rocks, two rocks 20 and 29 feet high, lie 1.5 miles northward of Cone Rock. They are of small extent and lie 1 mile off Rocky Point. Eastward of Turtle Rocks, the ground is foul, with two breakers lying 600 and 800 yards from the outer rock, and numerous visible rocks thence to the beach.

A bell buoy is moored 0.5 mile westward of Turtle Rocks.

Rocky Point, 5.5 miles northward of Trinidad Head, is a bold rocky point with cliffs about 200 feet high, bordered by numerous rocks and ledges extending 200 to 300 yards offshore. The point is covered with oak and scrub pine for 0.5 mile back to the redwood forest; through this oak growth project two rocky pinnacles about 250 feet high.

Northward of Rocky Point, the cliffs are succeeded by a low, sandy beach for 4.5 miles to the entrance of **Big Lagoon,** which lies immediately behind the sand beach. Above the entrance to Big Lagoon, the cliffs recommence and extend 2 miles to **Stone Lagoon.**

A conical rock lies 6.2 miles northward of Rocky Point and 1.5 miles northward of the northern end of the narrow strip of beach separating Big Lagoon from the ocean. It is a sharp-pointed cliff about 400 feet high, of light-gray rock distinguishable 15 miles in clear weather from any direction.

Sharp Point, at the northern end of the sand beach in front of Stone Lagoon, lies 7.8 miles northward of Rocky Point. It is a high, projecting point, with a precipitous face southward, and sharp slope northward, where a low sand spit extends for 0.5 mile to a second rocky head and thence for another 0.5 mile to the Gold Bluffs. A fresh water lagoon lies behind each sand beach. Numerous rocks, extending about 0.8 mile offshore, border the beach.

The southern point of **Gold Bluffs** lies about 9 miles northward of Rocky Point. They extend northward for 9 miles, ranging from 100 to 500 feet in height, the first 3 miles being comparatively low and bordered by several outlying rocks. About 4 miles from the southern end, the cliffs are broken by two moderately broad valleys. These bluffs are composed of gravel and sand and are not rocky.

Mussel Point, 11.2 miles northward of Rocky Point, is a light-gray cliff about 300 feet high, with a small, flat top distinguishable at 10 to 12 miles in clear weather.

Redding Rock, 94 feet high and of small extent, lies broad off Mussel Point, nearly 4.5 miles offshore. It is dark for about one-third the height and white above with a cleft on the southern face. It rises abruptly from depths of 20 fathoms and can be approached close-to with safety. It is marked by **Redding Rock Light*** on a white skeleton tower. The light is 98 feet above the water and visible 11 miles.

Northward of Gold Bluffs the coast becomes rocky, irregular, and broken, the bold cliffs being bordered by many rocks.

A yellow clay slide extending from the top of about a 900-foot slope to the beach, is located 9 miles northward of Mussel Point. It is sharp at the top, broad at the base, and the highest and most prominent of the bluffs in that vicinity. It may be seen in clear weather for a distance of 15 to 18 miles.

Split Rock is a slightly projecting head 3.5 miles northward of the northern end of Gold Bluffs; it is so named on account of the cut on the northern face.

High Bluff is a slightly projecting head 0.8 mile northward of Split Rock. It is prominent on account of an enormous split or chasm on its northern face; at the southern edge of the cut the bluff is 340 feet high.

White Rock, 107 feet high, lies 600 yards northward of High Bluff and 300 yards offshore. Numerous rocks, sunken and visible, lie between it and the beach. Its southern face is very precipitous, and its western face is steep, sloping northward. It can be distinguished by its color for several miles.

*Lat. 41°20′.4, Long. 124°10′.7: Charts 5702, 5002, 5052, 9000.

Flint Rock Head, 177 feet high, is a detached, rocky head which is connected with the cliffs by a low sand spit. It lies at the southern end of the Klamath River sand beach, 1.8 miles northward of Split Rock. Its southwest face is precipitous. A rock awash lies 0.8 mile 315° from Flint Rock Head and about 0.5 mile offshore.

The **Klamath River** empties about 16 miles southward of Point St. George and 30 miles northward of Trinidad Head. It is a large river with an extensive, mountainous watershed. The mouth of the river is now (1941) on the northern side of the valley near the northern headland. The sand spit extending from the southward is partially reinforced by pilings. Local boats carry 4 to 6 feet into the river. The bar has not changed much in the last 2 years but local knowledge is essential to make the entrance. There is some small boat traffic on the river.

Requa is a small town on the northern shore of the river just inside the mouth. There is a fish cannery of some size in the town, but it is no longer operated. A highway bridge has been constructed across the Klamath River about a mile above Requa.

Red Mountain (**Mount Turep**), 4,225 feet high, 8 miles eastward of the mouth of Klamath River, is a prominent landfall in this vicinity, and in clear weather is visible about 60 miles seaward.

From the mouth of the Klamath River, the coast curves northwestward for 3 miles to the mouth of **Wilson Creek.** The cliffs are high, irregular, and jagged, and the hills above are covered with grass and chaparral. Numerous rocks extend about 300 yards offshore.

A sunken rock, 0.6 mile offshore, lies 1.4 miles 297° from the mouth of the Klamath River. A rock, 37 feet high, lies 1 mile offshore a little over 2.5 miles 318° from the mouth of the Klamath River and about 1.5 miles southward of Wilson Creek.

False Klamath Rock, 203 feet high and round-topped, is the most prominent rock on this part of the coast. It lies 650 yards westward of the southern point of the small cove into which Wilson Creek empties. It can be distinguished for several miles by its reddish color.

Wilson Rock, with but 2½ feet over it, lies 0.5 mile 270° from False Klamath Rock.

A rock awash lies 0.9 mile 324° from False Klamath Rock. Numerous sunken rocks lie eastward and northeastward of the line from this rock to the rock, 37 feet high, southward of False Klamath Rock.

From False Klamath Rock, the coast for 7 miles northward consists of bold, rocky cliffs, much broken and bordered by numerous sunken and visible rocks. Beyond these, extending about 4 miles to Crescent City, is a broad sand beach backed by flat land under cultivation.

Midway Point lies 4 miles northward of False Klamath Rock. It is bold, rising to an elevation of 820 feet 800 yards from the beach.

Sister Rocks, a cluster of prominent rocks 0.5 mile westward of Midway Point, consist of three large and several smaller rocks covering a limited area; the outer one is 69 feet and the inner one is 72 feet high.

CRESCENT CITY AND POINT ST. GEORGE

(CHART 5895)

Crescent City is located on the northern side of a small, rocky, contracted bay about 3 miles southeastward of Point St. George. The port has been improved by the construction of 2 breakwaters, one of which extends to a point 1,000 yards from **Battery Point** in a direction toward Round Rock. This breakwater gives good protection from

the northwestward, but the anchorage is open to the southward. The second breakwater extends from the shore to Whaler Island. A wharf is built out from the town and vessels are moored off the wharf, and loaded by means of cranes on the dock; the largest crane is capable of lifting 10–12 tons. Small craft not exceeding this weight are hauled out for repairs, etc. Repairs to machinery of small launches only can be made. A considerable number of fishing vessels use the harbor and avail themselves of the wharf facilities. There is a depth of 17 feet at the tanker moorings and 12 feet alongside the face of the wharf. Lumber is shipped to the wharf by rail from nearby sawmills. There is a limited water supply on the wharf; gasoline is available and diesel oil and distillate may be had in limited quantities. There is also an oil wharf built out southwestward to **Pelican Rock.** This wharf is partially in ruins (1941) and there are no plans for repairing it. No tankers have called here since 1939. Neither pilots nor towboats are available. Communication is by motor vehicles over highways to the north and south and toward the interior; there is no through rail connection. There is an excellent hospital at Crescent City.

The approaches to the harbor are bad, and the greatest caution must be observed in making the anchorage.

Crescent City Light*, situated on a small rocky islet 45 feet high, 200 yards southward of Battery Point, is shown from a white tower on dwelling. The light is 77 feet above water and visible 14 miles. The beach between the islet and the point is bare at half tide.

The dangers in the cove and approaches are too numerous to mention in detail. From Crescent City Light, numerous rocks above and under water extend southward for 0.8 mile and also east-southeastward for nearly 0.8 mile, to a buoy which marks the western side of the entrance. The eastern side of the entrance channel is marked by a lighted bell buoy. **Round Rock,** lying 0.9 mile 145° from Crescent City Light, is 45 feet high and has deep water close-to. A pinnacle rock lies 0.4 mile westward of Round Rock and is marked on its southern side by a buoy. **Mussel Rock,** only a few feet high, lies 0.6 mile southeastward of Round Rock. Eastward of Round Rock are numerous sunken rocks which extend northward to **Whaler Island,** 90 feet high and the largest in the cove. The channel between the westernmost of these rocks and **Fauntleroy Rock** is marked by the buoys mentioned above.

A whistle buoy is 1.6 miles 182° from the light.

In approaching from southward, keep Crescent City Light bearing northward of 346° until up with the whistle buoy, to clear **Chase Ledge,** lying 0.9 mile 175° from Round Rock. In thick weather, the depth should not be shoaled to less than 100 feet until the whistle buoy is made. From the whistle buoy steer **032°** so as to pass over 100 yards westward of Round Rock, and from the rock steer **026°** and pass between the black buoy and the lighted bell buoy. After passing these buoys, haul gradually westward for the wharf and anchor in 21 feet.

In approaching from westward, when Round Rock is made, it may be steered for on any bearing northward of 88°, passing 0.8 mile or more southward of Crescent City Light. When up with Round Rock proceed as directed in the preceding paragraph.

Caution.—Vessels anchored in the harbor should take precaution against a local southeasterly wind known as the *kick back* or *back draft,* which frequently blows with considerable violence at night. This wind only follows periods of strong northwesterly winds outside. It usually starts in about 9:30 p. m. and dies out about midnight.

*Lat. 41°44′.7, Long. 124°12′.1: Charts 5702, 5895, 5002, 5052, 9000.

From Crescent City Light to Point St. George, 3.4 miles, the coast is moderately low, but rocky, with numerous rocks above and under water extending 0.8 mile offshore. **Castle Rock,** the largest, is 233 feet high, and lies 2.3 miles 301° from Crescent City Light and 0.5 mile southward of the southern point of Point St. George. It has a rather flat top with a small knob near the eastern edge. By passing 0.8 mile or more southward of Crescent City Light and over 0.3 mile southward of the outer visible rocks, all dangers between the light and Castle Rock will be avoided.

Point St. George is low, with several irregular and rocky hillocks near the beach. The seaward face is about a mile long in a northwesterly direction, with sand dunes and low land immediately behind it. The tree line is about 0.6 mile inland, with a few trees near the southern end of the point. Numerous prominent rocks fringe the point between Castle Rock and Brown Rock, one of which, **White Rock,** 45 feet high, shows an arch from westward. **Brown Rock** is 28 feet high and lies at the end of the reef of visible rocks which extend 0.5 mile west-northwestward of the northwestern end of Point St. George; the reef extends 250 yards southwestward from Brown Rock.

There is a **radio direction finder station** on Point St. George. The station renders continuous service.

St. George Channel, with a width of over a mile, is a clear channel between the visible rocks fringing Point St. George and the easternmost rocks of St. George Reef. It is frequently used by coasting steamers in clear weather.

St. George Reef is a group of rocks and sunken ledges, extending 6.5 miles northwestward and westward from Point St. George. There are nine visible rocks in the group.

St. George Reef Light* on **Northwest Seal Rock,** the outermost rock, is shown from a white square pyramidal tower on pier. The light is 146 feet above water and visible 18 miles. From November 1 to March 1, the light is displayed from 1 hour before sunset to 1 hour after sunrise. A fog signal is sounded on a two-toned air diaphone.

Star Rock, the southeasternmost rock of the group, is 64 feet high and lies 2 miles 277° from the southern end of Point St. George. Between Star and Northwest Seal Rocks are three rocks, **Hump, Whale,** and **Southwest Seal,** almost in line, varying in height from 18 to 45 feet. Southward of this line of visible rocks are two sunken ledges, **Mansfield Break** and **Jonathan Rock.** The latter lies 2.5 miles 289° from Star Rock and 3.2 miles 155° from Northwest Seal Rock. It breaks only in a heavy swell, and then not continuously, and has deep water surrounding it. Mansfield Break lies 2.3 miles 162° from Northwest Seal Rock and nearly 3.5 miles 298° from Star Rock. It is about 100 yards in extent, with 20 fathoms close-to and around it.

The **Great Break** lies 0.5 mile 149° from Southwest Seal Rock and is about 150 yards in extent. A sunken ledge showing a heavy breaker at low tide lies 125 yards southwestward of Southwest Seal Rock.

Dragon Channel, which leads northward of Jonathan Rock and between Mansfield Break and the Great Break, is not recommended.

East and **Long Rocks** lie 2.1 and 1.65 miles, respectively, 349° from Star Rock. On this line and 1 mile northward from Star Rock is a rock visible at lowest tides; southeastward from this rock, 0.3 mile distant is a rocky patch with but 15 feet, in which a rock, with but 5 feet over it, has been reported.

Flat Rock lies nearly midway between Long and Whale Rocks, and about 0.6 mile from the former. **Mussel Rock** lies nearly 0.5 mile 284° from Long Rock; a sunken ledge

*Lat. 41°50′.2, Long. 124°22′.5: Charts 5702, 5895, 5002, 5052, 9000.

showing a breaker lies 200 yards 9° from the rock. A sunken rock breaking in moderate swells lies 330 yards 26° from Hump Rock.

All the rocks of St. George Reef rise abruptly, and when in the vicinity the lead gives no warning of their presence. In thick weather, the greatest caution should be observed and the reef given a wide berth.

POINT ST. GEORGE TO PYRAMID POINT

(CHART 5702)

For about 10 miles northward of Point St. George, sand dunes, with a broad sand beach, extend to the mouth of **Smith River, Lake Talawa** and **Lake Earl,** surrounded by low, marshy land, behind this stretch of dunes.

A small rock, about 10 feet high, lies 1.75 miles southward of the mouth of Smith River and nearly 0.5 mile offshore. A cluster of three low rocks lies nearly a mile offshore and 1.1 mile 200° from Prince Island.

PYRAMID POINT TO CAPE SEBASTIAN

(CHART 5896)

Pyramid Point*, a rocky knoll, 213 feet high, marks the northern point of Smith River.

Prince Island, of small extent and 171 feet high, lies 0.1 mile offshore abreast Pyramid Point. **Hunter Rock,** 177 feet high, double-headed and somewhat smaller, lies 0.25 mile northward of Prince Island. Several other smaller rocks are in the vicinity.

Between Smith River and Chetco River, a distance of nearly 7 miles, the coast is composed of low, rocky cliffs, bordered by numerous rocks and ledges, sunken and awash, and backed by a low, narrow tableland. Several prominent, rocky knolls rise from 100 to 200 feet above this tableland.

The **Winchuck River,** a small stream with 0.5 mile of low sand dunes on the southern side of its mouth, empties 3 miles northward of Prince Island. The outermost rock lies 1 mile offshore southwestward of the Winchuck River, 2.6 miles 342° from Prince Island.

Cone Rock, 1.3 miles northward of Prince Island and 0.6 mile offshore, is the most prominent of the visible dangers in this vicinity. It is 68 feet high and of small extent.

The remaining dangers are too numerous for description, and this stretch of coast should not be approached closer than 1.5 miles.

Chetco Cove, at the mouth of the **Chetco River,** is about 15.5 miles northward of Point St. George. It affords an indifferent anchorage, with some protection from northwesterly winds, but is exposed in southerly weather. There are numerous visible and sunken rocks fringing the shore of the cove and its approaches, necessitating caution in its use. Near the middle of the cove, at the mouth of the river is a sand and gravel beach over 0.5 mile in length. From southward the valley of the river is well marked even in hazy weather. Just inside the entrance to the river on the west bank, is a prominent lone concrete bridge pier. On the northern shore of the cove, westward of the mouth of the river is the village of **Brookings,** which has a post office. A wharf with its piling resting on rock has been built out about 300 feet to **Bell Rock.** Anchorage may be had in about 9 fathoms, sandy bottom, in the general vicinity of a private buoy

*Lat. 41°57′.1, Long. 124°12′.6: Charts 5896, 5702.

moored 1,100 yards southward of **Yellow Rock.** Protection from northerly weather and good holding ground are afforded.

No directions are necessary.

From Chetco Point to Cape Ferrelo, about 4.5 miles, the coast is composed of high, broken cliffs, bordered by numerous rocky islets and ledges, extending in some cases over 0.5 mile offshore.

Goat Island, 184 feet high, lies 2 miles northward of Chetco Point and 500 yards offshore. There is deep water off its western and southwestern faces, but rocks and foul ground extend 200 yards southward from the southeastern point. The island is readily identified; its profile closely resembles that of Prince Island off the mouth of Smith River.

Cape Ferrelo is the first prominent headland northward of St. George Reef, and, while not projecting seaward to any considerable extent, it is noticeable on account of its bold, rugged face. Several rocks and islets lie directly off the cape to a distance of 0.5 mile.

From Cape Ferrelo to Crook Point, the coast is very rugged and rocky, with several large and prominent rocky islets and reefs extending well offshore, forming, in some cases, anchorage for small vessels in northerly weather.

Whales Head is the outer of two rocky islets, 128 feet high, 2.3 miles northward of Cape Ferrelo. A rock awash lies 800 yards southward of the highest point of Whales Head.

A rugged cliff from 200 to 300 feet high lies 3.3 miles northward of Cape Ferrelo. The face is about a mile in length and behind it rises a treeless, triple-headed hill to heights of 700 to 800 feet.

Leaning Rock, 49 feet high, lies close inshore, about 3.5 miles northward of Whales Head. It has a perpendicular face on its northwestern side and slopes gradually southeastward. Several other rocks are in its vicinity.

Between Whales Head and Crook Point are two prominent, apparently grassy areas in the forest near the crest of the hills, about 2 miles apart and situated at an elevation of nearly 2,000 feet; the southern one is known as **Rocky Prairie.** These are noticeable when off this section of the coast.

Yellow Rock, 84 feet high, lies about 4.5 miles northward of Whales Head, and 0.5 mile offshore. The rock is yellowish in color and can be recognized from 4 miles offshore.

Bosley Butte, 3,403 feet in height, from westerly and northwesterly positions offshore, shows above the coast ridges as flat-topped, with two summits separated by a slight depression. From offshore, what appears as the northeasterly summit shows rounded, and appears somewhat larger and slightly lower than the eastern summit.

Mack Arch* is a double-headed, rocky islet 0.8 mile offshore, 1.5 miles southward of Crook Point and about 8 miles northward of Cape Ferrelo. The western head is 231 feet high and the eastern a little lower; both are black to near the summits, which are generally white from bird droppings. The arch, about 100 feet high, is under the eastern summit and shows prominently from southward. A rock awash lies 125 yards southward of the eastern point.

Anchorage.—The bight to the eastward of Mack Arch has been used as a tempo-

*Lat. 42°13′.7, Long. 124°24′.5: Charts 5896, 5702, 5052, 9000.

rary anchorage during moderate northwesterly weather. The rocks and reefs break the swell. In approaching the anchorage, pass to the southward of Mack Arch about midway between it and Yellow Rock. Anchor in 11 fathoms, sand bottom, with Mack Arch bearing 296° and Yellow Rock bearing 155°. No breaks were noted, but caution is to be exercised as the place has not been closely surveyed. There is a farm in the cove northeastward of Mack Arch.

Mack Reef extends from Mack Arch to Crook Point, and comprises some 30 rocks, visible or sunken, varying in height from awash to 110 feet. From southward these rocks stand out conspicuously when seen against the white sand dunes northward of Crook Point, Mack Arch, on account of its size and height, being the most prominent.

Mack Arch Cove lies immediately eastward of the reef and affords fair shelter in northwesterly weather in 6 to 7 fathoms, sandy bottom. In entering from southward, pass eastward of Mack Arch, giving it a berth of about 150 yards, but taking care to avoid the rock 125 yards southward of its eastern point. Then bring the 125-foot rock, the highest of the northern part of the reef, to bear **352°** and steer for it on that bearing until up to the anchorage abreast the group of rocks 0.5 mile northward of Mack Arch. Local steamers drawing less than 12 feet find smoother water by continuing the 352° course through the kelp and anchoring in 4 fathoms with the 125-foot rock bearing 333°, distant 300 yards. This latter anchorage is contracted and is not recommended.

Crook Point is moderately low, but terminates seaward in a rocky knoll, 175 feet high, with a slight depression immediately behind it. The rocks close to the point often show up during moderately thick weather, several being of very noticeable pinnacle formation.

From the vicinity of Crook Point to the mouth of the **Pistol River** are sand dunes which show up prominently in clear weather and distinctly mark this section of the coast. In thick weather, these dunes can not readily be distinguished. From the mouth of the river to Cape Sebastian are numerous rocks and rocky islets extending 0.3 mile offshore, reaching in some cases a height of 150 feet. The Pistol River bar opens in the rainy season; its location varies from year to year.

Cape Sebastian is prominent from either northward or southward. It is the seaward termination of a ridge transverse to the coast, and rises abruptly from seaward to a height of 694 feet, with a depression behind it, and then more gradually to a height of about 2,000 feet. The seaward face is precipitous and broken and has a few trees; southward the lower part is grass-covered. A sunken rock with 1¾ fathoms over it at low water, seldom breaking, lies 0.5 mile offshore, 0.9 mile 342° from the western extremity of the cape.

Hunter Cove is a small, contracted anchorage under the southeastern face of Cape Sebastian. It is formed partly by the cape and partly by **Hunter Island** in the entrance. The island is 0.2 mile in extent, rocky, flat-topped, and 113 feet high. Shoal water extends from it eastward to the beach. The cove is used occasionally by launches and small craft. During strong northwesterly weather, the sea at the entrance is rather lumpy for small boats. There is a small stream at the head of the cove which furnishes good clear water. With moderate southwesterly weather, a heavy sea piles up across the entrance between the cape and Hunter Island. The cove is not recommended as an anchorage.

CAPE SEBASTIAN TO HUMBUG MOUNTAIN

(CHART 5951)

From Cape Sebastian to the mouth of Rogue River, a distance of about 6 miles, the coast is considerably broken and quite rugged, but rather low in the vicinity of the beach, and has but few outlying rocks.

Hunter Creek empties about 4 miles northward of Cape Sebastian; it is small and unimportant. Off the mouth are three visible rocks, the outer or middle one, 2 feet high, lying nearly 0.5 mile offshore.

Rogue River is the first important stream northward of San Francisco. Tanbark, wool, and the output of several canneries are shipped and gasoline, distillate, and general merchandise are received. All commerce is now carried on by trucks and busses over the Oregon Coast Highway (U. S. 101). **Gold Beach**, on the southern bank of the river near its mouth, is the principal town, and opposite it, on the north bank, is **Wedderburn,** with a wharf having 5 feet of water at low tide. The bar at the entrance has a depth of 4 to 5 feet at low water, and is crossed only at high tide during the summer months by light-draft vessels with local knowledge. Owing to the shifting character of the bar no directions of value to a stranger can be given. A concrete arch highway bridge of approximately 60 feet vertical clearance crosses the Rogue River about 0.8 mile above its mouth. It is a prominent bridge from seaward when off the mouth of the river.

The low land of the river valley, and the rocks of Rogue River Reef are prominent from seaward.

The northern head of Rogue River reaches an elevation of 700 feet about a mile northward of its mouth, and the marked depression in the coast range made by the valley of the stream, is visible from a considerable distance seaward.

Rogue River Reef extends in a general west-northwesterly direction from the mouth of Rogue River for 4 miles, with a channel 0.5 mile wide separating it from the beach. This channel has been used occasionally, but it is not safe for a stranger. **Northwest Rock***, 4 miles 308° from the entrance to Rogue River, is the outermost rock of the reef and is 6 feet in height. In 1925 two vessels reported striking an obstruction westward of Northwest Rock. The bottom is very broken here, and as the area has not been swept by a wire-drag, vessels are advised to give this rock a berth of at least 1.5 miles. A sunken rock with 2½ fathoms over it, lies 0.3 mile 282° from Northwest Rock. **Needle Rock,** 106 feet high, is the most prominent of the rocks and lies nearly in the middle of the group, 3 miles 302° from the northern point of the river; the needle is on the southern side of the rock. **Pyramid** and **Double Rocks** are prominent, and are 46 and 53 feet high, respectively. A rock with 2¾ fathoms over it, lies 2 miles 185° from Needle Rock and 2.8 miles 262° from the mouth of the river, and shows a breaker with an ordinary swell. A rocky patch with 4¾ fathoms over it lies 2.5 miles 248° from the mouth of the river and 2.5 miles 172° from Needle Rock; this patch generally shows a breaker.

Northward of Rogue River the coast trends nearly northerly for about 10 miles and then northwestward to Cape Blanco. The mountains are high, irregular, dark, and covered with chaparral. For 5 miles northward from the mouth of the river the beach is bordered by numerous rocks, but beyond that the coast is comparatively clear with the exception of Orford and Blanco Reefs.

*Lat. 42°27′.9, Long. 124°30′.0: Charts 5951, 5702.

A group of sunken and visible rocks, 1 mile long and 0.5 mile wide, lies 5 miles northward of Rogue River and nearly 2 miles offshore; these rise abruptly from 12 fathoms. **North Rock,** 7 feet high, is the largest and is nearest the beach. A sunken rock with 1¼ fathoms over it lies 1,345 yards 298° from North Rock.

The channel between Rogue River Reef and the mainland, and North Rock and the mainland, is sometimes used by coastwise freighters in clear weather. This channel should not be attempted by strangers.

Sisters Rocks are a group of three rocky islets 10.5 miles northward from the mouth of Rogue River. The northern and largest one is about 350 yards in extent and 394 feet high, and lies close to a projecting, rocky point, 260 feet high. The second one lies 250 yards southward of the first and is 150 yards in diameter and 149 feet high. The southern and outermost is about 150 yards long and only 15 feet above water, and lies a little over 0.4 mile southward of the middle rock and nearly 0.8 mile offshore. There is fairly smooth water in northwesterly weather under the lee of the largest islet, which was the site of the old landing of the village of **Frankport.**

Colebrooke Butte, 2,050 feet high, appears from the westward as a cone with gentle sloping sides. The upper part usually shows against the skyline and is readily recognized. From the southward, it shows as a rounded peak which resembles Brushy Bald Mountain, though it is somewhat lower. The northern part of the summit is tree-covered and dark green in color; the southern part is grass- and brush-covered and light green in color. The slopes are timbered except for the lower part of the seaward slope which is bare and brown in color.

Brushy Bald Mountain, 2,493 feet in height, shows up in hazy weather as a flat, rounded peak with a gentle slope from easterly and southerly directions.

Lookout Rock, 2.3 miles northward of The Sisters, is a prominent, projecting cliff, 560 feet high, with a marked depression behind it; the seaward face is precipitous.

Bald Mountain, 2,954 feet in height, appears from offshore as an irregular knob at the northwesterly end of a long ridge. **Rocky Peak**, 3,187 feet high, on the southeastern end of the ridge, is a sharp conical peak. From a southwesterly direction, three peaks or knobs show; from north-northwesterly directions, two peaks show almost in range. These peaks were used by the early navigators as a landfall for Port Orford in coming from the northward.

Humbug Mountain, 1,740 feet high, lies 5.3 miles northward of Sisters Rocks and 4 miles southward of Port Orford. It is conical in shape, and its seaward face is steep and rugged. It is a prominent feature from seaward.

HUMBUG MOUNTAIN TO CAPE BLANCO

(CHART 5952)

Island Rock,* 222 feet high, lies 1.3 miles off the seaward face of Humbug Mountain. It is about 350 yards in extent and flat on top. About 200 yards off its northwestern end is a needle rock, 109 feet high. These islands are prominent when approaching Port Orford from southward. Except for two small rocky patches with least depths of 10 fathoms and 6¾ fathoms, 900 and 600 yards, respectively, northward of Island Rock, there is deep water around these islands and between them and the beach. Between Humbug Mountain and Island Rock is a favored passage for northbound coasting steamers in northwesterly weather.

*Lat. 42°40′.0, Long. 124°28′.5: Charts 5951, 5952, 5702, 5020, 9000.

Redfish Rocks are a group of islets covering an area about 0.5 mile square, lying 2 miles northward of Island Rock and nearly 1 mile offshore. They are five in number and range from 60 to 140 feet in height. Many sunken rocks lie within this area.

Port Orford lies about 6.5 miles southward of Cape Blanco and 19 miles northward of Rogue River. It affords good shelter in northwesterly weather, but is exposed and dangerous in southerly weather. It is easy of access, and is probably the best northwesterly lee northward of Point Reyes.

The Heads, 300 feet high, forming the western point of the cove, appear from the southward as a long ridge with three knobs. The inner two are slightly higher, and tree-covered. **Tichenor Rock,** 92 feet high, lies 175 yards southward of The Heads.

Battle Rock, high, narrow, and black, lies in the northern part of the cove close to the shore and is detached only at extreme high tides. There is a conspicuous wreck located at the low-water line about 200 yards eastward.

A wharf is situated in the northern part of the cove, close under a high point. The depths alongside are 15 feet at the inner end of the loading face, and at the outer end are controlled by 3 small rocky pinnacles with depths of 17 and 18 feet. Vessels moor alongside the northeastern face of the wharf to load. Inshore of this loading face the depths are shoaler; this part of the wharf is used by crab fishermen. Water, in limited amounts, is piped to the dock, and may also be obtained in an emergency, by a small boat at the Coast Guard boathouse in Nelly Cove.

Dangers.—There is a rock with least depth of 5 feet, 165 feet from the inner end of the wharf. It is usually marked by kelp. The remains of a former breakwater, the outer end of which is submerged and marked by kelp, extends about 100 yards southeastward of **Graveyard Point** to just southward of the wharf, and affords a fair lee for the wharf in southwesterly weather. Several dangerous rocky patches marked by kelp are in the area eastward of a line drawn about east-southeastward from the foot of the wharf. Other important rocky patches are: 2¾ fathoms 2,075 yards 308° from **Rocky Point;** 2¾ fathoms 1,225 yards 294° from Rocky Point; 4¾ fathoms 1,550 yards 230° from Rocky Point.

Anchorage may be had slightly to the westward of the center of the cove, in 10 fathoms, sand bottom. A bell buoy is moored 0.5 mile southward of Tichenor Rock. Small craft may anchor closer to The Heads where better protection is afforded against the northwesterly winds which sweep with considerable force through the depression at the head of the cove. Two rocks, awash at high tide, lie near the western side of the cove, near The Heads. In approaching Port Orford at night, a few lights in the town usually will be seen.

Port Orford is a small town situated in the cove. It is noted chiefly as being the home of the famous Port Orford yellow cedar. Yellow cedar logs are shipped to Coos Bay by truck over the Oregon Coast Highway. Communication is by bus, telephone, and telegraph; an occasional shipment is made over the wharf by steamer. Supplies can be obtained here only in limited quantities. The main coastal highway passes through here and marine supplies can be ordered from larger nearby towns if necessary.

Port Orford Coast Guard Station is located at **Nelly Cove,** 0.4 mile westward of the Port Orford Wharf. The Coast Guard lookout tower, white, 253 feet high, is prominent from the southward and is reported to be mistaken at times for Cape Blanco Lighthouse. The white watertank on the summit at an elevation of 362 feet and northward of the tower, shows just clear of the nearby trees. When seen from a considerable distance offshore, the tank also resembles Cape Blanco Lighthouse. It is visible

farther to seaward than the lighthouse by reason of the dark, solid timber background which brings the tank into prominence.

Klooqueh Rock, 101 feet high, black and conical, lies 0.3 mile off the northwestern face of Port Orford Head. It is prominent, especially when coming from the northward inside Orford Reef. There is a rocky ledge, bare at low water, extending about 50 yards from the eastern face of this rock, and a rock, bare 2 feet at high water, lies about 330 yards eastward of Klooqueh Rock.

From Port Orford Head to Cape Blanco, about 6.5 miles, the coast extends in a general northwesterly direction. Northward of the head, the shore is a narrow sand ridge, rising at one point to 160 feet, covered with grass, fern, and brush, and ending abruptly nearly 3 miles from Port Orford Head at the edge of the Elk River Valley. Northward of this point are sand dunes extending to the mouth of **Elk River,** a small, unimportant stream. Beyond the mouth of Elk River to Cape Blanco, the coast consists of vertical cliffs, wooded to the edges, and in some places over 150 feet high.

Orford Reef is composed of a group of irregular rocks and sunken ledges, about 2.5 miles long by 1.5 miles wide, extending in a northerly direction. The northernmost limit of the reef is about 2 miles southward of Cape Blanco Light, and the southernmost limit lies about 5.5 miles westward of the western head of Port Orford. A channel, 2 miles wide, leads eastward of the reef, following the general trend of the coast, but at its northern end where it turns westward, it is contracted to 0.8 mile by the reef extending southward and westward from Cape Blanco. This channel is much used in clear weather, but should not be attempted in thick weather. There is considerable kelp eastward of and inside Orford Reef.

Orford Reef lighted whistle buoy is located 1.3 miles 218° from Fox Rock. This buoy is the guide for clearing the reef.

Fox and **Southeast Black Rocks,** 1.3 miles apart, are the two southernmost rocks of Orford Reef. The former is 10 feet high, and lies 5.9 miles 291° from Port Orford Head; the latter is 6 feet high and lies 1.3 miles 93° from Fox Rock, with a heavy break, and 2 rocks, awash, at extreme low water, about 0.2 mile 312° from it.

Steamboat, West Conical, and Arch Rocks are the prominent ones in the southern part of Orford Reef, and extend in a general north-northeasterly direction about 0.25 mile apart.

Steamboat Rock is so named on account of its appearance from northward or southward.

West Conical Rock, 112 feet high, is so named on account of its shape, the highest point being on the northwesterly side.

Arch Rock is 149 feet high, with steep sides and a large, square arch visible from southward or southwestward; it is the inshore one of the three rocks.

Conical White Rock, 81 feet high, is nearly in the middle of Orford Reef, and 0.3 mile northwestward of Arch Rock.

Best Rock, 147 feet high, is the largest of the northern group of rocks. Foul ground extends from it southward and eastward for nearly 0.4 mile, and for 0.8 mile northward in the direction of Cape Blanco. The northernmost part of this danger lies 1 mile 92° from Northwest Rock with the eastern edge of Seal Rock in range with Arch Rock; Klooqueh Rock is also in range with Tichenor Rock off Port Orford Head.

Seal Rock, 53 feet high, is large and lies 0.25 mile southward of Best Rock. **Long Brown Rock,** 70 feet high, lies nearly 0.5 mile westward of Best Rock; **Large Brown Rock** lies midway between and a little northward. **Square White Rock,** 72 feet high, lies about 0.5 mile westward of Seal Rock, with **Round Rock** midway between and a little

northward of them. Between these rocks are numerous smaller ones, some sunken and some visible.

Northwest Rock, 15 feet high, the northwesternmost rock of Orford Reef, lies 3 miles 226° from Cape Blanco Light. Keeping Northwest Rock bearing north of 72° will clear all shoals on Orford Reef of less than 10 fathoms. There is a 9-fathom spot 600 yards 338° from Northwest Rock.

Blanco Reef extends about 1.5 miles southwestward from Cape Blanco, and consists of numerous rocks and sunken ledges, some of which are marked by kelp. **Pyramid Rock,** 30 feet high, lies nearly 1 mile 260° from the lighthouse. There are no visible rocks outside of it, but several between it and the cape and Orford Reef. **Black Rock,** 24 feet high, black and narrow, about 125 yards long, lies 0.65 mile 176° from Pyramid Rock. The following rocky patches are the outermost known dangers on Blanco Reef: 5¾ fathoms 600 yards 228° from Black Rock; 5¼ fathoms 900 yards 257° from Black Rock; 3¾ fathoms 900 yards 238° from Pyramid Rock; 4¾ fathoms 650 yards 275° from Pyramid Rock. There is a rock awash at half tide 0.4 mile northward of Pyramid Rock. There is a rocky patch with 1¾ fathoms over it 1,350 yards 92° from Black Rock.

Cape Blanco projects about 1.5 miles from the general trend of the coast. It is a small, bare table land, terminating seaward in a cliff, 225 feet high, with low land behind it. A large, high, rock lies close under the southern side of the cape. From seaward the cape is not prominent, but from northward or southward, it appears like a moderately low, bluff islet. The group of buildings at Cape Blanco is very prominent.

Cape Blanco Light* is shown from a white conical tower situated about in the center of the flat part of the cape. The light is 245 feet above the water, and visible 22 miles. The light is displayed from 1 hour before sunset to 1 hour after sunrise. There is a radiobeacon but no fog signal. The water tank and lookout tower at The Heads should not be mistaken for Cape Blanco Light. See Port Orford Coast Guard station on page 185.

Numerous sunken and visible rocks extend 0.5 mile or more northwestward from the cape.

*Lat. 42°50′.2, Long. 124°33′.7: Charts 5952, 5702, 5802, 5052, 9000.

Chapter 11.—CAPE BLANCO TO YAQUINA HEAD

(CHART 5802)

From Cape Blanco to Yaquina Head, 112 miles, the coast is remarkably straight and trends in a north by easterly direction. It differs considerably from the coast to the southward. The coastal mountains are much lower, the difference being more marked because of the high mountains inland. The shore consists of high yellow sand dunes and cliffs, broken by bold, rocky headlands of moderate height, and backed by low, pine-covered hills. There are few outlying dangers, the farthest offshore being at Blacklock Point, Coquille River, and Cape Arago.

CAPE BLANCO TO BLACKLOCK POINT

(CHART 5952)

Gull Rock, 108 feet high, lies about 1 mile northward of Cape Blanco Light, with sunken rocks surrounding it, and between it and the beach. Its seaward face is black and rugged, and the summit of the rock is marked by two knobs, the higher being at its southern part. A rocky patch of 3 fathoms lies 0.5 mile westward of Gull Rock.

Castle Rock, 180 feet high, lies about 1.5 miles northward of Cape Blanco Light, about 300 yards offshore and abreast the mouth of **Sixes River.** It rises abruptly from the sea, and is readily made out from seaward at a distance of 10 miles. Several low rocks and sunken ledges surround it for a distance of about 400 yards. There are two rocky islets, 54 and 24 feet high, to the west and northwest.

Blacklock Point is a precipitous rocky point about 2.5 miles northward of Cape Blanco. The cliff is 157 feet high, with a sharp, high point, bordered by rocks, stretching out nearly 300 yards. A narrow, curved line of rocks extends west-southwestward from the point for 0.8 mile. **Tower Rock,** 113 feet high, is the principal one and lies nearly 700 yards west-southwestward of the point. A rock, showing a breaker in heavy weather, with 10 feet over it, lies 1.0 mile 300° from Blacklock Point. Rocky patches of about 4 fathoms lie within 1.25 miles of Blacklock Point, in a westerly and northwesterly direction.

BLACKLOCK POINT TO COQUILLE POINT

(CHART 5802)

From Blacklock Point, the shore continues rocky with cliffs gradually decreasing in height for 1.5 miles northward. Thence for about 11 miles, the shore is a broad sandy beach backed by sand dunes and long narrow lakes. The tree line lies at an average distance of 0.2 mile from the sea. From the end of the sand beach to the mouth of the Coquille River, 3 miles, the shore again consists of rocky cliffs from 40 to 80 feet high, with a number of outlying rocks reaching 0.5 mile from shore, and sunken dangers extending 1.6 miles westward from Coquille Point. The land directly behind this stretch of coast is comparatively flat and wooded, rising to heights of 1,000 feet in 2.5 to 3 miles.

COQUILLE RIVER

(CHART 5971)

Coquille River empties about 18 miles northward of Cape Blanco. The principal shipments consist of lumber, railroad ties, farm produce, and the output of several canneries. General merchandise, machinery, and farming implements are received. The river is in the customs collection district of southern Oregon; the port of entry is at Marshfield, on Coos Bay.

The southern point at the mouth of the river is 60 feet high, with several outlying rocks, of which the highest is 86 feet. Broken, rocky bottom, showing breakers in any swell, extends a distance of a little over a mile beyond the outermost visible rock. The outermost danger is **Coquille Rock,** with 28 feet over it, which lies 1.6 miles 311° from **Coquille Point;** it breaks only in very heavy weather. All other known offshore dangers are southward of a line between Coquille Rock and **Table Rock.**

A lighted whistle buoy, moored 1.8 miles 298° from South Jetty Light, is the guide for clearing the above dangers.

The north bank of the river, at the entrance, is a long, low, narrow spit of shifting sand dunes.

Coquille River South Jetty Light, located on the outer end of the southern jetty, on a white skeleton tower on concrete block, is 30 feet above water, and visible 11 miles. The fog signal is sounded on an air horn.

Coquille River Former Lighthouse*, at the southern extremity of the northern spit, is a white conical tower attached to a dwelling.

The river has been improved by the Government, and the entrance channel is confined between jetties built out to 12 feet. The outer portions of both jetties are submerged. In 1941, construction was being undertaken to raise the ends of the jetties and cap them with concrete.

The bar is narrow, and in June 1941 there was a controlling depth of 12 feet over it, thence 10 feet in the channel to Bandon. The channel is marked by a lighted range and buoys. It is reported that a sand spit forms in the channel near the outer end of the north jetty every summer, but it cuts out again in the winter. The channel is subject to frequent changes, and the deepest water is not always on the range. Strangers should obtain local information as to conditions before entering. Above Bandon the reported controlling depths were: to Coquille 6½ feet, and to Myrtle Point 3½ feet in June 1934. †In _____, 19___, the controlling depths in the channels were:

There is very little shipping on the river above Bandon. It consists of an occasional raft of logs or barges of lumber between the mills on the river and the railroad at Coquille.

Bandon, situated on the southern bank at the mouth of the river, is the principal port. Lumber, railroad ties, farm produce, and dairy products are shipped; general merchandise, machinery, and agricultural implements are received. The depths at the wharves vary from 12 to 17 feet.

Prosper, about 4.5 miles above the mouth of the Coquille River, ships considerable quantities of lumber when the mills are in operation. The depths at the wharves are ample for the vessels that can ascend the river. It is the head of navigation for the

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*Lat. 43°07′.5, Long. 124°25′.4: Charts, 5971, 5802.

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

coastwise lumber schooners. In 1933 the mills had been out of operation for 6 years, and two of them had burned; there had been no shipping during this period.

Riverton, about 16 miles above the mouth, of the river has coal mines which supply the various towns along the river. The coal is all handled by trucks.

Coquille, about 24.5 miles above the mouth of the river, is the distributing center for the various agricultural communities of the river valley. It has railway connection with the interior.

Pilots and towboats.—The port of Bandon owns and operates a towboat. The towboat captain acts as pilot. The pilot boat-tug is stationed about 0.1 mile upstream from the Coast Guard station. Vessels desiring a pilot should signal the Coast Guard station, or radio ahead to the port of Bandon.

Supplies.—A limited amount of provisions and ship chandlery is available at Bandon. Some fuel oil may be had, but in drums only. There are some coal mines on the river above Bandon, and some coal is hauled in by trucks.

Repairs.—Ship carpenters may be had, and there is a machine shop and a foundry in Bandon. The port of Bandon maintains a marine ways at Prosper to haul out the port dredge and tug.

A Coast Guard station is located near the western end of the waterfront at Bandon. The lookout tower is 260 yards 123° from Coquille River South Jetty Light.

Communication is by steamers from Bandon, and bus and truck over the highways to Coquille, and southward along the coast. There are telegraph and telephone connections. Coquille is on the railroad.

To enter.—At high water and with a smooth bar, vessels drawing less than 11 feet should have no difficulty in reaching the wharves at Bandon. From a position 100 yards northward of the lighted whistle buoy, steer **120°** to a position 100 yards northward of the buoy 700 yards off the outer ends of the jetties, at which point the vessel should be on the lighted range for entering. This range does not show well in daytime, but vessels will be on it when the street on which the beacons are placed, and which shows from seaward as a gap between the buildings at the foot of the bluff and those along the waterfront, shows midway between the ends of the jettties. Follow the range, course **111°**, until Coquille River Former Lighthouse Tower on the north bank bears 67°, then haul to the northward and pass the waterfront at a distance of 50 yards to the desired berth.

Vessels of greater draft than 11 feet should take a pilot, as local knowledge is necessary for following the best water. It must be remembered that the bar and the channel between the jetties are subject to changes, so that too great reliance must not be placed on the chart.

When the bar is rough, strangers, irrespective of draft, should not attempt to enter without a pilot, as local knowledge of the undertow is necessary to avoid being carried upon the ends of the jetties.

COQUILLE RIVER TO COOS BAY

(CHART 5802)

From the entrance to Coquille River, the sand dunes extend northward for about 4 miles and are then succeeded by cliffs.

Fivemile Point, about 6 miles northward of the river, is a projecting rocky cliff about 60 feet high, with a cluster of rocks, 10 to 40 feet high, extending more than 0.3 mile offshore.

Northward of Fivemile Point, the coast consists of cliffs, 40 to 80 feet high, which 2 miles southward of Cape Arago increase to heights of 100 to 250 feet, are heavily wooded, and cut by seven or more deep gulches, locally known as the **Seven Devils,** from the rough coast trail leading around and over them. Numerous rocks of varying shapes and sizes border the beach.

South Cove, immediately under the southern point of Cape Arago, is a small contracted anchorage available in summer for small vessels with local knowledge.

Cape Arago, about 29 miles northward of Cape Blanco, is an irregular, jagged point projecting about a mile from the general trend of the coast. There are no high mountains immediately behind it, and it is conspicuous only when the mountains in the interior are obscured. The seaward face of the cape, 2.5 miles long in a northerly direction, is a narrow, sparsely wooded tableland, 50 feet high, with rugged and broken cliffs and outlying rocks of the same height as the cliff. Immediately off the cape are reefs extending northwestward for about a mile. A small cove near the northern end, inside the reefs, is sometimes used by very small vessels with local knowledge.

COOS BAY

(CHART 5984)

Cape Arago Light* is shown from a white frame octagonal tower attached to a building, situated 2.5 miles northward of the cape on a rocky, partially wooded island, close inshore. The light is 100 feet above the water and visible 16 miles. The fog signal is sounded on an air diaphragm horn. A radiobeacon, equipped for distance finding is located here. Difficulty in hearing the fog signal on occasions has been reported.

Baltimore Rock, with 11 feet over it, lies 0.6 mile northwestward of the light, and generally shows a breaker. It is the outermost detached rock of a sunken ledge extending northwestward from the lighthouse island, and has 42 feet of water close around it. It is marked by a bell buoy moored about 400 yards northward of it.

Coos Head, 220 feet high, is the southern point at the entrance to Coos Bay and lies 1.8 miles northeastward of Cape Arago Light. The cliffs are about 100 feet high and terminate in several small rocky points with sand beaches between them.

A **radio direction finder station** is located on the outside coast, about 2 miles northward of the northern jetty.

A **Coast Guard station** is located on the southern point at the entrance, 0.3 mile eastward of Coos Head.

Coos Bay is about 13 miles in length by 1 mile in width, with a tidal area of about 15 square miles. The entrance lies about 33 miles northward of Cape Blanco and 1.5 miles northward of Cape Arago Light. The commercial importance of the bay has increased materially in recent years. Large quantities of lumber are shipped, and there is also a considerable traffic in farm and dairy produce, fish, and coal. General merchandise and agricultural and mill machinery are received.

Since its improvement by the Government the bay can be used as a harbor of refuge, and may be entered in any save exceptionally heavy weather.

Prominent features.—Coos Head, Umpqua River Light, and Cape Arago Light are good guides in making the entrance to the bay. The sand dunes northward toward the Umpqua River are prominent.

The entrance to the bay is near the southern part of the bay. It has been im-

*Lat. 43°20′.5, Long. 124°22′.5: Charts 5984, 5802, 5052, 9000.

proved by the Government by the construction of two jetties, completed in 1929, and by annual dredging on the bar.

The project calls for a channel 24 feet deep through **Pigeon Point Reef** to a turning basin 1,000 feet long and 600 feet wide at Marshfield of the same depth; thence 22 feet to Millington.

In October 1942, the controlling depths were as follows: Entrance channel over the bar, 33 feet: entrance to Guano Rock 18 feet; thence to North Bend 21 feet. In May 1942, the controlling depth to Marshfield was 23 feet and 19 feet in the Turning Basin. In June 1940, the controlling depth to Millington was 21 feet. †In _____ 19____, the controlling depths in the channel were: _____

_____

_____

It is quite usual to have the bar channel shoal 8 or 9 feet during the winter. Strangers should not enter without obtaining local information as to conditions.

The channels are well marked by lights, beacons, and buoys including numerous lighted ranges.

Guano Rock lies on the southern side of the entrance channel, about 250 yards northwestward of Coos Head. This rock now shows only at extreme low water, the top having broken off. It is marked by a lighted whistle buoy moored 200 yards northwestward of the rock.

A rock with 24 feet over it is located about 30 yards northward of the Coos Bay entrance range and about 170 yards 0° from Guano Rock. Sections of both jetties at the entrance to Coos Bay have subsided so that the flow of water is not restricted and this may result in changes in depth in the channel between the jetties.

A **submerged jetty** extends 700 yards southwestward from **Fossil Point;** northwestward of the point, rocky patches, with depths of 17 to 18 feet, contract the channel slightly between the 18-foot curves. In entering with a strong northwesterly wind, large vessels have difficulty in making the turn and are apt to find themselves being set down toward the submerged jetty. Caution is required here under these circumstances.

A pinnacle rock with 9 feet over it is reported to lie about 175 yards northward of the outer end of the submerged breakwater. It is well clear of the channel. There is a lighted buoy 150 yards southwestward of the rock and about 200 yards from the outer end of the submerged jetty.

Pilots are available and can be arranged for by radio through the Portland Station, or can be had by signal to the Coast Guard station. Pilot charges each way are $2.50 per foot draft and 2 cents per net register ton. Deductions from the fixed charges are made depending on vessel's tonnage. This applies to vessels under registry. The pilot boat is a diesel towboat of 125 horsepower. A surfboat is maintained in back of Cape Arago Light for use when the bar is too rough to take out the towboat.

Towboats.—Private towboats, ranging from 100 to 165 horsepower, are available.

Quarantine.—Regulations of the Public Health Service are enforced by the contract surgeon at Marshfield. Vessels with communicable disease on board should not pass Empire until boarded by the quarantine officer. Facilities are available for fumigation by sulphur only.

Customs.—Marshfield is the port of entry for southern Oregon, embracing the following ports: Umpqua, Siuslaw, Bandon, Port Orford, and Gold Beach (Rogue River). Vessels subject to customs inspection are boarded in the upper harbor.

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

Marine hospital.—There is a contract surgeon for the Public Health Service at Marshfield.

Anchorage may be had at almost any point inside the bay, dependent upon the draft. Outside the entrance vessels with local knowledge have ridden out southeasterly gales by anchoring close under Cape Arago in 30 to 36 feet, but this is dangerous if the wind shift to the southwest.

Tides.—The mean range of tide at Marshfield is 6 feet. The range between mean lower low water and mean higher high water is 7.3 feet. A range of about 12 feet may occur at the time of maximum tides.

Currents.—A short series of current observations in the entrance taken during the month of September indicated a mean velocity of about 2 knots. The greatest observed ebb velocity was a little over 3 knots.

DIRECTIONS, COOS BAY

Vessels should make sure of the entrance range before standing close-in. There is usually a current sweeping either to the northward or southward, just off the jetties, and this current should be guarded against, especially when outward-bound. The shore range should be observed carefully until clear of all dangers. The southerly current is often encountered during the summer months. During the winter, with strong southerly winds, the current sets to the northward. There is also a tendency for outbound vessels to sheer off the entrance range toward Coos Head. This is probably due to the sand spit to the northward approaching very close to the range.

From the entrance, the bay extends northward for 6.5 miles, with an average width of 0.8 mile, and then bends southeastward for 3.8 miles, terminating in a shallow basin, 1.5 miles in width, surrounded by marshland and intersected by several sloughs.

Vessels of 20 feet or less draft, having crossed the bar shortly before high water, should have little difficulty in reaching the wharves at North Bend or Marshfield, as the dredged channels are well marked by ranges, lighted beacons, and buoys. The chart is the guide, and no other directions are necessary.

The following statement concerning the currents at the entrance was furnished by the master of the Government bar dredge in 1916:

> The time of slack water varies with the height of tide. The ebb runs from 1 to 1½ hours after low water, and the flood from ½ to ¾ hour after high water. During long runouts I have found an ebb current of 5 knots at Guano Rock, and up to 7 knots at the bell buoy, same buoy being run under a times in winter months. Flood current—maximum velocity, 3½ knots.
>
> From the bell buoy to the outer end of the north jetty, the ebb generally sets west (mag.), with a strong tendency toward the south spit. From midway between the end of the jetty and the black buoy, and well out across the bar, the ebb invariably sets strong to south, from 1 to 3 knots. At times I find it necessary while dredging on 286° course to haul up to northwest to overcome it. (Dredging is done during the summer.)
>
> Entering in rough or heavy weather this should be especially guarded against. With the run of the sea and the set, a ship is more likely to be set upon the south spit than upon the jetty.
>
> The present ranges are good guides when visible. The current never sets north at the whistle or channel buoys except under a continued spell of strong southerly winds.

The following information relative to the navigation of Coos Bay was furnished by the commanding officer of a United States destroyer in 1927:

> The best time to enter Coos Bay to go alongside dock is to arrive off whistle buoy about 45 minutes before slack water at Coos Bay entrance. By entering at this time and steaming at 12 knots you can carry a small flood current all the way up. To dock at North Bend, get into the turning basin and

swing the ship to go alongside against the flood current. If it is not desired to dock heading out, it is best to wait an hour. The time of change of current at North Bend is approximately 45 minutes later than at the entrance.

In general, Coos Bay does not present any particular difficulties for ships drawing 15 feet or less, but a commanding officer who has not been in before should be particularly careful not to mistake piles (which are driven indiscriminately for log booms) for spar buoys and range dolphins. From the information the writer gathered from pilots it is always unsafe to cross the bar at the entrance if there is a medium or heavy swell running and care should be used in steering through the jetties, where whirlpools are likely to be encountered. This ship encountered a slight whirlpool 45 minutes before the tide turned to ebb, and it was considered necessary to straighten out the ship with the engine.

From northward or southward, the course should be shaped for the lighted whistle buoy. From seaward Cape Blanco and Cape Arago are the prominent features, and at night their lights furnish an excellent means for determining a vessel's position, after which a course can be laid for the lighted whistle buoy.

Approaching from any direction in thick weather, great caution is essential. The currents are variable and uncertain. Velocities of 3 to 3.4 knots have been observed at the lightships between Blunts Reef and Swiftsure Bank, and velocities considerably in excess of these amounts have been reported. For detailed information regarding the conditions which may be encountered and the precautions to be observed, see the statement on coastwise navigation beginning on page 37.

Under the above conditions, particular care is necessary in this locality. The depths should not be shoaled to less than 50 fathoms until the fog signal on Cape Arago has been made.

Strangers should not attempt to cross the bar unless the entrance range can be seen, and not then unless the bar is smooth enough so that a speed can be maintained sufficient to have the vessel under full control at all times. The fact that the outer end of the jetty is submerged should be borne in mind. The most favorable time for crossing the bar is on the last of the flood current, and on many occasions it is passable only at this time. Vessels entering Coos Bay are usually light, and therefore are not often bar-bound outside, but when loaded with lumber outward bound, a fairly smooth bar has to be selected, and bar-bound vessels inside, especially during the winter months, are not uncommon.

Bridges.—Westward of North Point the bay is crossed by a railway trestle The section of this trestle which crosses the main channel of the bay is a swinging drawbridge, with a clear opening of 200 feet on either side of the draw span central pier; vertical clearance is 12 feet at MHW. The draw span is kept open at all times except when closed for the passage of trains. During foggy weather a fog bell installed in the center of the draw span strikes when the bridge is open. At any time during foggy weather when the draw span is closed a siren is sounded, which can be heard a distance of 1 mile. When the bridge is again opened the siren is stopped, indicating that the way is clear for the passage of vessels. Between **North Point** and **Russell Point,** 0.6 mile eastward of the railroad bridge, is a fixed highway bridge. The center span has a horizontal clearance of 515 feet and a vertical clearance of 124 feet at MHW.

South Slough, shoal and navigable by small boats only, extends 4 miles southward from its junction with the bay near the entrance. The slough is crossed by a highway bridge with a draw span, at a point 0.4 mile southward of the back entering range light. The bridge has a clear opening of 60 feet and a 12-foot vertical clearance at MHW when closed.

The western shore of the bay as far as the bend is formed by a sand spit, covered

with sand dunes, partly wooded and reaching in some places to a height of 100 feet. On the eastern shore and above the bend, are low, rolling hills, covered with timber.

Empire is situated on the eastern shore of the bay about 4 miles above the entrance. There is a sawmill here with a wharf having a 300-foot berthing space, with 17 feet alongside. There are two prominent oil tanks at Empire. The Government has constructed a dock here for the use of the seagoing dredge employed in dredging the bar.

Haynes Slough and **North Slough** join the bay through a common entrance on the northern side of the bay at the end. These are navigated by small boats and launches engaged in marketing the produce of several farms situated on the sloughs.

Local Magnetic attraction with differences of as much as 2½° less than the normal variation has been observed on land, on each side of the channel from **Pony Point** to **White Point.**

Marshfield and **North Bend** now form practically one continuous settlement extending along the shore from North Point to the mouth of Coalbank Slough.

North Bend, 4.5 miles above Empire, is located on the eastern side of North Point. It is a prosperous town with sawmills, factories, and a small shipyard. Considerable lumber is shipped from here.

Port Terminal.—Midway between North Bend and Marshfield, the Port of Coos Bay owns and operates a dock 1,005 feet long with cargo-handling gear and rail connections. The dock was in a poor state of repairs in 1941 and very little freight was handled over the pier. Full effect of the tide cannot be had, for vessels must leave their berths before high water in order to reach the bar on the tip of high water.

Marshfield, on the western shore near the head of the bay, is the principal town. It is the port of entry for the collection district of southern Oregon, a deputy collector being stationed there. It is the distributing center for a considerable section of the country devoted to lumbering, coal mining, dairying, and agriculture. There are ample wharfage facilities with depths of 9 to 18 feet.

Three sloughs empty into Coos Bay, between Coos River and Marshfield. **Coalbank Slough** is unused and has bridges across it near the mouth. **Isthmus Slough** has been improved by dredging to a depth of 22 feet to **Millington.** Most of the lumber from the bay is shipped from sawmills on this slough. **Catching Slough** is navigable for several miles by light-draft vessels and is used mainly for logging operations.

The **Coos River** empties through two channels into the bay at its head. The northern channel, unmarked, follows the eastern side of the bay and empties abreast of North Bend. The **Marshfield Channel,** marked by beacons, crosses the flats and empties abreast the town of Marshfield. The river is navigated for 14 miles by light-draft steamers engaged in towing logs and carrying farm and dairy produce. The river has been improved by the Government, and a draft of 4 feet at LLW, can be taken with difficulty to the head of navigation. Due to snags and shoaling in the south fork, 3 feet only can be carried to the head of navigation (1941). There is daily launch service on the South Fork from Marshfield to **Smith Camp No. 1** for mail, passengers, and produce. During August and September, the river is at its lowest stage.

Supplies.—Fuel oils, coal, water, provisions, and ship chandlers' stores can be obtained at Marshfield and North Bend. The city water is reported to be of poor quality, but is suitable for boilers.

There is a **chart agency** of the U. S. Coast and Geodetic Survey situated in Marshfield and another at North Bend.

Repairs.—There are no facilities for extensive repairs. Machine shops are available, but there are no dry-docking facilities except for scows and small gas boats.

Communication is by rail and truck to the interior and by regular lines of steamers plying between Columbia River, Coos Bay, Humboldt Bay, and San Francisco. There is also considerable local traffic in smaller vessels to various local points north and south. Communication may be had by telegraph and telephone.

Storm warnings, day and night, are displayed by the United States Weather Bureau from a steel tower at Marshfield, and at the Coast Guard station at the entrance to Coos Bay.

COOS BAY TO UMPQUA RIVER

(CHART 5802)

From Coos Bay to Umpqua River, about 19.5 miles, the coast consists of sand beaches and dunes backed by moderately low hills. The mouth of **Tenmile Creek** is 13.7 miles northward of Coos Head.

UMPQUA RIVER

(CHART 6004)

Umpqua River has its entrance 20 miles northward of Cape Arago Light. Considerable lumber, the output of several salmon canneries, and farm and dairy produce, are shipped; general merchandise is received. The port of entry is at Coos Bay.

The southern point at the entrance to the river is marked by sand dunes, partly covered with trees, and reaching elevations of 300 feet. About a mile below the entrance is a bright bare spot in the dunes that shows prominently among the trees.

Umpqua River Light* is shown from a white conical tower situated on the southern entrance point. The light is 165 feet above the water, and visible 19 miles. Trees surround the lighthouse and only the lantern shows over their tops.

The northern point at the entrance consists of shifting sand dunes, extending northward for about 3 miles. These are bare as a rule, and on the river side, reach elevations of 100 to 124 feet.

A **Coast Guard station** is located on the northern bank of the river about a mile inside the entrance.

The entrance has been improved by the construction of north and south jetties. The outer 500 feet of the northern jetty is submerged at high water. The southern jetty is in fair condition except that about 1,000 feet of its outer end has been beaten down to low-water level (in 1941). The channel over the bar is reported to be shoalest usually during the month of September. Later in the season the river cuts a deeper channel through the bar. In August 1942, the controlling depth over the bar was 16 feet. †In_____ 19____, the controlling depth over the bar was____feet.

The entrance channel is subject to frequent changes. Strangers should obtain local information as to conditions before entering.

Inside the entrance, the channel has been improved to Reedsport, and in October 1942, there was a controlling depth of about 19 feet. There is a turning basin at Reedsport with project dimensions of 1,000 feet in length, 600 feet in width and 22 feet deep. In June 1942, the controlling depth was 21½ feet. At high tide, the river is navigable

*Lat. 43°39′.7, Long. 124°11′.9: Charts 6004, 5802, 5052, 9000.

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

by vessels of 6 feet draft to **Scottsburg,** 23 miles above the entrance, and a draft of 3 feet can be taken up the **Smith River** to **Sulphur Springs,** about 25 miles above the entrance. †In _____ 19____, the controlling depths in the channels were:

The channel to Gardiner is no longer marked, and there is no shipping from that point. The channel to Reedsport is marked by lights and buoys. Just above the mouth of **Scholfield Creek** there is a highway bridge with a swing span; horizontal clearance 195 feet, through both openings, vertical clearance 30 feet at MHW. A railroad drawbridge with openings of 150 feet clear width on either side of the central pier and a vertical clearance of 15 feet at MHW, when closed, is situated 0.25 mile above the highway bridge. The signal for opening the draw is one long blast of the whistle, followed quickly by one short and one long blast. During foggy weather an answering signal of one long blast from the whistle on the bridge will indicate that the draw is open for the passage of boats, and a succession of short blasts will indicate that there will be some delay in opening the draw.

A channel from Gardiner to Reedsport, which is commonly used by launches carrying freight and passengers from the railway station to Gardiner, follows the eastern shore to the cannery, 0.5 mile above Gardiner, then leads through the flats and around the northern and western sides of Bolon Island. A post light marks the crossover.

A cut-off channel has been dredged to 6 feet across the flats northwesterly from **Bolon Island,** making nearly a straight channel between Reedsport and Gardiner. It is marked by two lighted post beacons.

Pilots and towboats.—Pilots may be obtained by making a signal to the lighthouse or Coast Guard station. There is a 90-horsepower gas tug available for work on the bar.

No directions that would be of value to a stranger can be given.

Winchester Bay is a small open cove on the eastern bank just inside the entrance to the river. There is a cold storage and ice plant on the easterly pier at Winchester. A new municipal pier is located between the cold storage plant and the old railroad trestle.

Ork Reef, a patch of rocks and sand, awash at half tide, lies abreast the northern end of Winchester Bay. Depths of 3 to 5 feet extend 350 yards southwestward of the reef. The eastern side of the channel near Ork Reef is marked by a lighted buoy.

Gardiner is located on the northern bank of the river, 7.5 miles inside the entrance.

Reedsport is a station on the railroad, and the principal town on the lower river. One of the sawmills was in opertation in 1941, and lumber was shipped out about twice a month. There is ample water at the wharves for vessels that can cross the bar.

Supplies.—Provisions, water, gasoline, and fuel oil for launches may be obtained.

Repairs.—Minor repairs to hulls or machinery can be made. Carpenters are available, and theıe is a machine shop at the lumbeı mill. There are facilities for docking launches up to 60 tons.

Communication is by rail to the interior, or to Coos Bay, and thence by steamer. The vessels calling here for lumber do not carry passengers. There is communication by telegraph and telephone.

The Oregon Coast Highway (U. S. 101) connects all ports along the Oregon Coast.

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

UMPQUA RIVER TO SIUSLAW RIVER

(CHART 5802)

From Umpqua River to Siuslaw River, about 21 miles, the coast is straight and consists of sand dunes broken only by the mouths of **Threemile Creek, Tahkenitch Creek, Siltcoos River,** and the stream flowing from **Cleawox Lake.**

SIUSLAW RIVER

(CHART 6023)

Suislaw River enters the ocean about 42 miles northward of Cape Arago Light, and 7.5 miles southward of Heceta Head Light. The river is in the Oregon collection district; the port of entry is at Marshfield, on Coos Bay.

The southern entrance point is a narrow spit of high, shifting sand dunes. The northern point consists of a low, flat sand beach, backed by rocky wooded cliffs of 50 to 100 feet in elevation.

Cannery Hill, 145 feet high and wooded, is situated on the eastern shore just inside the entrance, and is prominent from seaward.

The entrance has been improved by the Government by the construction of jetties. These confine the channel, which, prior to their construction, was subject to extensive changes in position. The approach is marked by a whistle buoy.

The bar is narrow, and the depths vary a great deal because of storms and freshets. In June 1938 there was a controlling depth of 6 feet on the bar. The controlling depth to Cushman was about 8 feet in 1934. †In _____, 19___, the controlling depths in the channel were:_____

_____

Light-draft vessels can ascend the river to **Mapleton,** but the channel is narrow and crooked.

A **Coast Guard station** is located on the eastern bank, 0.5 mile southward of Cannery Hill. The lookout station is on Cannery Hill.

Florence is a small town on the northern bank of the river, 4 miles inside the entrance. The sawmill here is closed and there is no commerce.

Glenada on the southern bank of the river, opposite Florence, is a small town of no commercial importance.

The river is crossed by a double-leaf bascule highway bridge between Florence and Glenada.

Cushman, on the northern bank of the river, 2.5 miles above Florence, has lumber and shingle mills. The product from these mills is shipped by rail.

About 1 mile above Cushman, the river is crossed by a railway drawbridge, with a clear opening of 100 feet on either side of the central draw span, with 15 feet vertical clearance when closed. The signal for opening is 1 long blast of the whistle, followed quickly by 1 short and 1 long blast. During foggy weather, an answering signal of 1 long blast from the bridge indicates that the draw is open for the passage of boats, and a succession of short blasts indicates that there will be some delay in opening the draw.

Pilots and towboats.—Neither pilots nor towboats are available. Strangers desiring a pilot might obtain the services of fishermen with local knowledge by signaling the Coast Guard station.

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

Supplies.—Water and limited amounts of provisions are obtainable. Gasoline and oil may be obtained.

Repairs.—Minor repairs only can be made. Carpenters are available and minor machine work can be handled at the mills.

Communication is by rail to the interior and by the Oregon Coast Highway along the coast. There are telegraph and telephone connections.

Directions.—No directions that would be of value to a stranger can be given. With a smooth bar, vessels drawing 10 feet may enter at high water and follow the chart to Florence. If desiring to proceed above that point, a pilot should be employed.

SIUSLAW RIVER TO YAQUINA RIVER

(CHART 5802)

From Siuslaw River to Heceta Head, about 7 miles, the coast is composed of sand dunes that are quite conspicuous from contrast with the dark trees with which they are partly covered.

Heceta Bank lies 70 miles 350° from Cape Blanco; it is about 30 miles offshore and covers an irregular area about 30 miles long and 10 miles wide. The least water found on the bank is 25 fathoms, but the soundings are irregular. Northward and southward of the bank the depths are considerably greater.

Heceta Head lies 28.5 miles 7° from Umpqua River Light. The seaward face is 2.5 miles long, with nearly vertical cliffs, 100 to 200 feet high. The summit of the head reaches an elevation of 1,000 feet in 0.5 mile from the cliffs, and is covered with grass and a few pines A sharp, black, conical rock, 180 feet high, marks the extreme western and northern part of the head and is easily made out from either northward or southward.

Heceta Head Light* is shown from a white conical tower on a bench cut in the high bluff near the western extremity. The light is 205 feet above the water, and visible 21 miles. The light is displayed from 1 hour before sunset to 1 hour after sunrise. Vessels from northward will not make out the tower or buildings until abreast the station, as they are shut out by the high bluff northward.

Cox Rock, 100 feet high, conical in shape and usually white on top with bird droppings, lies close under the southern part of the head.

From Heceta Head to Cape Perpetua, 9 miles, the coast consists of high, broken, rocky cliffs, with the exception of the first 2 miles, where it is much lower and formed by sloping, sandy cliffs, backed by a strip of clear land. The hills behind reach an elevation of over 800 feet in less than 0.5 mile from the beach and are heavily wooded, showing in many places large areas of burnt timber still standing.

Tenmile Creek, 5 miles northward of Heceta Head, is marked by a sand beach about 0.3 mile long at its mouth.

Cape Perpetua lies 9 miles northward of Heceta Head, and consists of two projecting points; the northern one is the bolder and reaches a height of 800 feet a short distance from the beach and 1,000 feet at a distance of 0.8 mile. The rocky cliff forming the face of the northern point is reddish in color, with a few rocks awash at low water, close under its face.

Yachats River, navagable only for canoes, breaks through the coast hills immediately northward from Cape Perpetua.

The coast northward of Cape Perpetua for 2.5 miles consists of cliffs, 15 to 30 feet

*Lat. 44°08′.3, Long. 124°07′.6: Charts 5802, 5052, 9000.

high, with a narrow strip of grassy land, 0.2 to 1 mile wide, behind them. Thence, for 5.5 miles, are low bluffs with a broad sand beach in front and comparatively low wooded country behind them to Alsea Bay.

Table Mountain, 2,852 feet high, lies about 11 miles northeastward of the mouth of Alsea Bay. It is flat-topped, covered with dead trees, and presents a whitish appearance. There is another summit, 2,752 feet high, about 0.6 mile southwestward of Table Mountain.

Alsea Bay lies about 8 miles northward of Cape Perpetua. The northern point is low, broad, and sandy; the southern point is an abrupt, rounding, sandstone cliff about 100 feet high, covered with trees. The entrance has the usual shifting bar, with about 6 feet at low water. A buoy is moored about a mile off the bar. With a flood tide, the bar fills in with sand, and the full effect of the tide cannot be counted on. There is considerable fishing and crabbing here. **Waldport** is the principal settlement. There is a fish cannery and wharf; gasoline, other light fuels, oil and few supplies are available. The Oregon Coast Highway crosses the bay on a fixed span bridge. No directions of value to a stranger can be given.

From Alsea Bay to Yaquina Bay, the coast is nearly straight for 11.5 miles. For 1.5 miles northward of Alsea Bay the shore is a low sand beach backed by sand dunes, and then changes to bluffs, which 2.5 miles farther north rise to heights of 70 and 100 feet.

Seal Rocks, abreast the highest part of the bluff, are low and extend parallel to the coast for 2.5 miles at a distance of 0.5 mile from the beach. The highest rock stands 20 feet above water.

Stonewall Bank lies about 17 miles southwestward of Yaquina Head Light. It is about 9 miles long in a northerly direction and 2.5 miles wide. There is a least depth of 13 fathoms on the bank.

Beyond Seal Rocks, the bluffs are low, with a broad sand beach, until within 1.5 miles of Yaquina Bay, where sand dunes begin and continue to its entrance. The land behind is comparatively low and wooded, with areas of burnt timber.

An area of sunken rocks is reported to exist from 2 to 4 miles northwestward of Seal Rocks, and about 1.5 miles offshore. There is a 2½-fathom patch 8.6 miles 188° from Yaquina Head Light, 1.5 miles from the beach.

Marys Peak, a prominent mountain 4,097 feet high, lies about 24 miles eastward of the entrance to Yaquina Bay; its sides are wooded, but its summit is covered with grass.

YAQUINA BAY

(CHART 6058)

Yaquina Head, 32.5 miles northward of Haceta Head, is distinguished by two conical hills covered with grass. The outer one is 355 feet high and the inner 390 feet high, with a low saddle, 200 feet high, between them. The extremity of the point, which projects about a mile from the general trend of the coast, is broken and rocky, but comparatively low. One mile inland from the point, the grass covered land changes to a dense forest and the hills rise rapidly. Two sunken ledges lie northward of the point, not over 0.5 mile from the beach. There is a sunken rock and considerable kelp about a mile southward of the point.

Yaquina Head Light* is shown from a white conical tower situated on the flat bench projecting at the western extremity of the head. The light is 162 feet above the

*Lat. 44°40′.6, Long 124°04′.7: Charts 6058, 5802, 5902, 5052, 9000.

water, and visible 19 miles. The light is displayed one hour before sunset to one hour after sunrise. There is a radiobeacon at the light.

A patch of rocks, awash at high water, lies about 1 mile north by eastward from the light.

Yaquina Bay has its entrance 3.5 miles southward of Yaquina Head Light. It is a tidal estuary, the bay proper being only the widening of the **Yaquina River** just inside the entrance.

The northern point at the entrance is a rounding, sandy bluff, 120 feet high; the old lighthouse tower, situated at the extremity, and the hotels and cottages northward of it, are prominent as daymarks. The southern point is a low sand beach, backed by sand dunes rising to 150 feet.

The entrance has been improved by the Government by building jetties out from the north and south entrance points, and several rocky patches between the ends of the jetties have been removed to 18 feet. About 125 yards of the outer end of the southern jetty is submerged. In April 1942, there was a controlling depth of 20 feet over the ocean bar on the entrance range. The controlling depth inside the bay to Newport was 18 feet; thence 11½ feet for the next 2.5 miles. †In _____ 19___, the controlling depths in the channel were: _____
_____
_____

The entrance channel is marked by a lighted range and is subject to change.

The maximum draft to which vessels are loaded in Yaquina Bay is 16½ feet. A smooth bar and favorable tide are necessary for this draft.

During the summer months, when the swell is roughly parallel to the coast, the bar is comparatively smooth, being partially sheltered by Yaquina Head. In winter, however, the heavy westerly swell renders it generally too rough to be crossed with safety.

Yaquina Reef, a ridge of hard sand and rock, with depths of 5 to 13 feet, lies 0.5 mile off the entrance, extending parallel to the shore, distant 1.5 miles.

South Reef is a southerly continuation of Yaquina Reef, the two being separated by a deep-water channel. A bell buoy marking the southern end of Yaquina Reef is the guide for this channel.

Yaquina Head Light, and a lighted whistle buoy 2 miles southwestward of the entrance and on the entrance range, are the guides for making the entrance.

A **Coast Guard station** is located at Newport. The lookout station is located on a wharf on the west side of Yaquina Bay, 760 yards north of Yaquina Bay Rear Range Light.

There is a fixed bridge across the entrance point just inside the jetties. The vertical clearance is 130 feet at MHW.

The river has been improved to Toledo, 11 miles above the entrance, by dredging wherever necessary to produce a channel 10 feet deep. This channel is well marked by aids, a few of which are lighted. In May, 1940, 8 feet was reported as the controlling depth. Above Toledo to the head of navigation, the controlling depth is 2 feet. †In _____ 19___, the controlling depths in the channel were: _____
_____

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

Newport, just inside the northern entrance point, is the principal town on the river and is a port of entry. Newport is of importance principally as a summer resort, although there is some halibut fishing, the catch being shipped by truck. Considerable lumber is now shipped from Newport. It is barged down from upriver mills and loaded on the lumber schooners at the wharves in Newport.

Anchorage.—No regulations are prescribed. Vessels choose anchorage in the channel at points suited to the draft.

Pilots and towboats.—Licensed pilots are available and can be obtained by signaling the Coast Guard station on the hill at the north point of the entrance. The local mill company has a towboat that is available at times.

A **customs** officer is stationed at Newport.

Directions.—No directions that would be of value to a stranger can be given. Strangers desiring to enter or to ascend the river should employ a man with local knowledge. At the entrance, the buoys cannot be relied upon as indicating the best water, and in the river the depths are subject to frequent change.

Supplies.—Fresh water, gasoline, distillate, and provisions can be obtained.

Repairs.—There are no facilities for making repairs, except for a small marine ways at Toledo with a capacity of 60 tons.

Communication is by rail to the interior, and by infrequent coasting vessels to Astoria. There is a good highway to the interior, and one along the coast. There is communication by telegraph and telephone.

Yaquina, a small settlement, is situated about 3.5 miles above the entrance.

Toledo, 11 miles above the entrance, ships lumber by both water and rail. The wharves have 10 to 12 feet alongside; there is an extensive spruce mill here. Practically all the shipping from Yaquina Bay originates at Toledo.

From Yaquina Bay to Yaquina Head, 3.5 miles, the coasts consists of broken, yellow cliffs bordered on the southern part by broad, low water, sand beaches.

Chapter 12.—YAQUINA HEAD TO COLUMBIA RIVER

(CHART 5902)

From Yaquina Head to the mouth of the Columbia River, the coast is fairly straight. The headlands are Cape Foulweather, Cascade Head, Cape Lookout, Cape Meares, Cape Falcon, and Tillamook Head. The 30-fathom curve follows the general trend of the coast about 3.5 miles offshore, without indicating the various headlands. When about opposite Tillamook Head, the curve swings west and is about 7.5 miles off the end of Clatsop Spit.

YAQUINA HEAD TO CAPE MEARES

(CHART 5902)

From Yaquina Head to Cape Foulweather, 4.5 miles, the coast consists of yellow and white sandstone cliffs, low and broken.

Iron Mountain, about 1.5 miles northeastward of Yaquina Light, is a hill about 654 feet high. The highest third of the hill is bare and composed of a red rock formation; the lower part is thickly wooded.

A low, flat, black rock, 2 feet high, lies 0.5 mile offshore about 2.9 miles northward of Yaquina Head.

Otter Rock, 11 feet high, lies 3.2 miles northward of Yaquina Head and 0.5 mile offshore. **Gull Rock,** 56 feet high, lies about 1.2 miles from Otter Rock and 750 yards offshore. In line between the two rocks is a kelp field with several rocks, sunken or awash. Northward of Gull Rock, 0.5 mile and 1 mile distant, lie sunken rocks marked by breaks.

Cape Foulweather* is a prominent headland with a seaward face 6.5 miles in length, consisting of rocky cliffs over 60 feet high. It is formed by several grass-covered headlands with densely wooded gulches between them. Near the middle of the cape is a strip of flat land, 0.5 mile long and 0.2 mile wide, bare of trees. The highest point of the cape is near the southern part; a grassy patch on the southwestern slope is a good landmark. About 0.9 mile southeastward of the extreme western point of the cape is a rocky point, 445 feet high and 0.6 mile eastward of this point, the hills rise to a height of 1,100 feet. Dangers extend for nearly 2 miles northward of the northern point of Cape Foulweather and nearly 600 yards off-shore.

The **Oregon Coast Highway** follows the shoreline closely at Cape Foulweather, approaching within 55 yards of the high waterline at some points.

Depoe Bay is about 1 mile southward from the northern end of the cape. A large concrete arch bridge over the entrance and seawall along the northern end of the bridge are prominent. The bridge has a vertical clearance of about 48 feet at MHW. About 0.2 mile northeastward of Depoe Bay is a hill about 500 feet high; its northern slope is wooded, while its southern slope, which drops sharply to the southwestward and seaward side is bare except for low brush. A whistle buoy is moored off the entrance to the bay. There is a lighted entrance range, azimuth 109° true, at the southern end of the

*Lat. 44°47′.0, Long. 124°04′.5: Charts 5902, 5052.

bridge. The front daymark, under the bridge deck, is a white square with a red vertical stripe; the rear daymark, over the bridge deck, is a white diamond with a red vertical stripe.

Depoe Bay is considered to be one of the best all weather shelters along this part of the coast. It may be entered in almost all weathers. There have been times when so many fishing craft were at anchor here that there was not even swinging room. Anchorage is excellent with very good holding ground. The present project provides for a channel 5 feet deep and 30 feet wide with a turning basin 125 feet wide, 375 feet long and 5 feet deep inside the bay. In May 1942, the controlling depths were 4.7 feet in the channel and 1.5 feet in the turning basin. †In _____, 19___, the controlling depths in the channel were:_____Care must be taken to make the turn in the channel as there is some surge in and out of the bay. Gasoline and oil are available at Depoe Bay.

From Cape Foulweather to the entrance of **Siletz Bay,** 5.5 miles, the coast continues as yellow, broken bluffs, 40 to 100 feet high, bordered by sandy beaches, for 3 miles. From the northern point of the bluffs to the entrance to the bay, are sand dunes, covered with low brush, on the spit bordering the bay.

Siletz River empties about 15 miles northward of Yaquina Head, the entrance being marked by a whistle buoy moored 0.8 mile off the bar, and a lighted range over the bar. The channel changes frequently, and 7 feet is considered to be the maximum draft that can be taken over the bar at high water. Considerable logging is being done here. Two light-draft tugboats tow rafts of logs out over the bar and up to the Columbia River.

The northern point at the entrance is a low bluff with a narrow sand beach. The southern point is a low sand spit, about 2.5 miles long and 250 yards wide, with dunes extending 0.6 mile northward from yellow, sandy bluffs. These dunes are thinly wooded near the shore, but become thickly wooded toward the interior. The bay within the entrance is shoal. **Taft** is the principal village in the bay. It is on the Oregon Coast Highway (U. S. 101) and regular bus and freight services are maintained the entire length of the Oregon coast. A Standard Oil station is maintained here; a light is shown from the top of a house on the oil wharf. Several stores handle general merchandise. Immediately southward of Taft is a white covered bridge that is prominent from seaward. At night the lights, both at Taft and the town of **Delake** about 2.5 miles northward, are very prominent. No directions that would be of value to a stranger can be given.

From the northern point of Siletz Bay, the coast extends 7 miles northward to the Salmon River. For 2.5 miles of this stretch, the yellow sandstone cliffs are from 80 to 100 feet high. At this point they cease altogether for 0.2 mile at the outlet of **Devils Lake,** a large body of fresh water, 10 feet above the sea, emptying through a narrow stream. At 0.5 mile 259° from the mouth of the stream lies a sunken rock, generally marked by a breaker. From the outlet of the lake for 3 miles northward, the bluffs are from 20 to 60 feet high, rising to grassy hills and with a broad low-water beach and ledges of rocks along the low-water line.

Salmon River empties at the southern limit of Cascade Head. It is of no commercial importance, as the entrance is nearly closed by sand bars. About 4 miles northward

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

of the Siletz River entrance, a rocky ledge, nearly covered at high water, extends along the low waterline for about a mile.

Immediately southward of Salmon River is a rocky cliff with a seaward face 0.6 mile in length, the summit being a dome-shaped butte 510 feet high; extending southward and eastward from this to the river is a rolling, grassy plateau with but few trees. A rock, 46 feet high, lies 700 yards westward of this cliff, and a sunken rock lies 630 yards from the beach about a mile southward thereof. Immediately southward of, and in line with Cascade Head, opposite the mouth of the river, three grayish rocks, lying about 765 yards offshore, have heights of 56 feet for the northern, 25 feet for the center rock, and 47 feet for the southern.

Cascade Head* lies 16.8 miles northward of Cape Foulweather. It is very jagged, heavily wooded, and prominent to vessels close inshore. The face of the cliff is 3 miles long, in places over 700 feet high, and is cut by several deep gorges through which the waters of three creeks are discharged from cascades 60 to 80 feet high. Several rocks lie about 0.1 mile offshore.

Two Arches Rock, 30 feet high, lies 0.9 mile northward of the southern point of Cascade Head, the surface sloping westward. The arches are visible from northward, the inner one being the larger.

From Cascade Head to Cape Kiwanda, 9.5 miles, the coast is a low sand beach with a narrow line of marsh behind the southern part. Rolling hillocks, occasionally wooded, rise to an elevation of 500 feet behind the beach.

Neskowin Rock rises abruptly from sand beach to 113 feet in height. The rock is of a dark brown igneous formation, and is wooded on top. It lies at the high waterline about 0.3 mile northward of the northern extremity of the cliffs marking Cascade Head.

Neskowin is a small village with a post office and a general store. The store supplies gasoline and oil in moderate quantities. The buses running to Tillamook make connections once a day. Hotel, garage, and telephone services are available.

North of Neskowin, the Oregon Coast Highway follows the shore at about 0.5 mile inland. At night the headlights of automobiles traveling this road cause intermittent flashes as they make the various turns and might be mistaken for lights of vessels or of lighthouses.

Nestucca River empties into **Nestucca Bay** about 5.5 miles northward of Cascade Head. The channel over the bar changes frequently in position and depth, and only vessels of light-draft with local knowledge are able to cross. The river has many snags that cause a changeable depth and shifting channel. Its entrance is marked by a buoy moored 0.5 mile westward of the entrance. Even in a moderate sea the entrance bar is extremely dangerous. The southern point at the entrance to the river consists of several low, rolling, grassy hillocks, about 400 to 500 feet high, which at this point approach very closely to the beach. The northern point is the southern extremity of the sand spit and dunes that extend to Cape Kiwanda.

Pacific City, a summer resort a mile southward of Cape Kiwanda, has a post office and a general store. Small quantities of oil and gasoline can be had. There are a hotel, telephone communication, and bus connections once each day, to Tillamook.

Haystack Rock, 327 feet high, lies 0.5 mile southwestward of Cape Kiwanda and 0.5 mile offshore. It is a prominent landmark when in this vicinity. It is conical in shape and dark for about half its height, the top in summer being white with bird droppings.

*Lat. 45°04′, Long. 124°01′: Charts 5902, 5052, 9000.

Cape Kiwanda is a low, yellow, rocky point, much broken and eroded, projecting about 0.5 mile from the general trend of the coast. Behind the cape are bright sand dunes, 500 feet high, which are prominent from seaward.

From Cape Kiwanda, the coast extends for 7.5 miles in a general northerly direction to Cape Lookout. It is broken about halfway by the entrance to Sand Lake, which is shallow and not navigable. The coast consists of sand beaches and dunes until about a mile northward of **Sand Lake,** where it changes to vertical sandstone cliffs, 50 to 100 feet high, which continue to Cape Lookout. The hills and country back of the beach as far as the ridge of Cape Lookout have been burned over except in the gulches, and numerous trunks of whitened trees are still standing.

Cape Lookout lies about 17.5 miles northward of Cascade Head and nearly 40 miles northward of Yaquina Head Light. It projects about 1.5 miles at right angles to the coast, forming a narrow rocky promontory 432 feet in height at its seaward extremity. The southern face is nearly straight, with precipitous cliffs, in which are numerous caves. The northern face is sloping and covered with a thick growth of timber. The ridge in continuation of the cape is at right angles to the coast and reaches an elevation of about 2,000 feet, 3.8 miles northeastward of the extremity of the cape. The northern face of the cape is smooth and bold for the first mile, and then is much broken and marked by caves and several cascades. Fair shelter in northwesterly winds may be had under the southern side of the cape, in 6 to 8 fathoms, sandy bottom.

Northward of Cape Lookout, for 2 or 3 miles, the land falls to a low, narrow, sandy peninsula, separating Netarts Bay from the ocean. The sand dunes on the peninsula are visible 10 or 12 miles from seaward.

Netarts Bay is a shallow lagoon about 4 miles long, with an average width of 1 mile. The greater portion is bare at low tide except the channel, close under the northern shore, which has from 6 to 7 feet. The village of **Netarts** is situated on the northern shore about a mile inside the entrance. It has a post office and a general store, and telephone and bus connections. Small quantities of oil and gasoline can be obtained but the village is of no commercial importance. Only light-draft vessels with local knowledge can enter, and no directions can be given that would be of value to a stranger.

Northward of the entrance to Netarts Bay, for 1.5 miles to the rocks forming the southern part of Cape Meares, the coast is a sandy beach, backed by cliffs 50 to 120 feet high. These cliffs are covered by sand dunes varying in height from 150 to 200 feet, and are good landmarks.

TILLAMOOK BAY

(CHART 6112)

Cape Meares is high and rocky, with a seaward face about 2 miles in length. The northern portion is the higher, with nearly vertical cliffs 460 feet high. The western point is narrow, covered with fern and brush, and terminates seaward in a cliff about 200 feet high.

Cape Meares Light* is shown from a white octagonal, pyramidal tower on the summit of the cliff. The light is 217 feet above the water, and visible 21 miles.

A pillar rock, 76 feet high, lies 0.2 mile northwestward of the point, and 0.4 mile farther in the same direction is **Pyramid Rock,** 109 feet high, which leans outward.

Three Arch Rocks are the largest of a cluster extending about 350 yards off the

*Lat. 45°29′.2, Long. 123°58′.5: Charts 5902, 6112, 5052, 9000.

southern point of the cape, and ranging in height from 204 to 275 feet. The largest arch is in the middle of the lowest rock, and is about half the height of the rock above water. These rocks are the favorite resort of sea lions, whose barking can be heard a considerable distance with a favorable wind.

From Cape Meares to Kincheloe Point, the coast is a low, partly wooded, narrow sand spit, with dunes 40 to 50 feet high. It forms the western shore of Tillamook Bay.

Tillamook Bay has its entrance about 42 miles southward of the Columbia River, 22.5 miles southward of Tillamook Rock Light, and 5 miles northward of Cape Meares Light. The bay is about 6 miles long and 3 miles wide, with a tidal area of about 13 square miles, the greater part of which, at low tide, presents a succession of sand and mud flats traversed by three principal channels which, although of fair depth near the entrance, gradually shoal toward the head of the bay.

The country tributary to the bay is devoted chiefly to farming and dairying; the shipments consist of these farm and dairy products, and lumber and fish. General merchandise is received. Most of the local products except lumber are shipped by rail or truck.

Kincheloe Point, the southern point at the entrance, is low and sandy. The northern point at the entrance is the southern termination of a high wooded ridge, lying between the bay and the Nehalem River. **Green Hill,** 421 feet high at the entrance opposite Kincheloe Point, is a spur from this ridge, terminating in a bluff, rounding point. It is bare of trees, but is covered with ferns and grass, and is a prominent feature in recognizing the entrance. A number of rocks lie close inshore, northwestward of the point. There is a 7-foot rock about 360 yards 255° from Green Hill.

A **Coast Guard station** is located on the northern shore at the entrance, 0.5 mile northwestward of Green Hill. The lookout station is on the jetty about 200 yards from its inner end, at the foot of a steep-sided knoll about 100 feet high.

The **Sow and Pigs,** a ledge of small extent and bare at half tide, lies in the entrance 0.4 mile eastward of the extremity of Kincheloe Point and 400 yards off the northern shore. This ledge is dangerous when entering with a flood tide, as the current sets toward it. The rocks of the ledge are marked by buoys.

The entrance has been improved by the Government by the construction of a jetty. The submerged toe of the jetty extends out about 100 yards. The entrance is subject to frequent changes.

In June 1942, there was a controlling depth of 14 feet over the ocean bar, and a channel with depths of 4 to 12 feet along the jetty to the turning basin at Miami; the controlling depth in the turning basin was 15½ feet and in the channel to Hobsonville 6 feet. †In _____, 19___, the controlling depths in the channel were:_____

The entrance is marked by a lighted range, and a lighted whistle buoy placed on the range 0.7 mile off the end of the jetty. The jetty was reconstructed in 1933, but the outer 300 feet have been beaten down by the sea. It is marked by a buoy placed off its end. The bar sometimes makes out across the range from the northward during the summer months or whenever there have been any long periods of northwesterly winds.

Inside the entrance, the bay is traversed by three principal channels, the **Bay City Channel,** the **Main Channel,** and the **South Channel.** Of the three, the Bay City Channel is the only one of any present commercial importance.

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners

Hoquarten Slough, a continuation of the Main Channel, is a narrow crooked waterway leading from the head of the bay to the town of Tillamook. It has ample depths for any vessel which can pass through the channels in the bay, but it is so tortuous that vessels over 100 feet long have difficulty in rounding the bends.

Main Channel has been abandoned below the crossover at Bay City. A depth of 6 feet is available in the Bay City Channel to the crossover, which is marked by a lighted beacon.

Above the limits of this dredged area, the Main Channel and Hoquarten Slough have been improved as far as Tillamook by the construction of dikes, the removal of snags, and by dredging in places, resulting in a channel with a least width of 60 feet, and a least depth of 4 feet. Vessels not over 100 feet long drawing 9 feet can reach Tillamook at high tide.

During the freshets, snags are carried into the upper portion of the bay where they form a menace to navigation.

Garibaldi, on the northern shore 0.5 mile inside the entrance, is a summer resort. There is a wharf built out to 3 feet. From Garibaldi northward, the beach is thickly lined with summer hotels and cottages. There is a Coast Guard Boat station at the end of a long wharf.

Pilots and towboats.—A pilot or fisherman with local knowledge, can be obtained by making a signal to the Coast Guard station. There are no towboats available.

Miami Cove is at the eastern end of the town of Garibaldi. There are the ruins of an old lumber mill on the northern side of the entrance to the cove; the machinery has been dismantled and the wharf is in poor condition and dangerous. Log rafts are made up off the pier and towed to Aberdeen. Tugs drawing up to 18 feet frequently use the channel southward of Sow and Pigs ledge.

Hobsonville, on the point 1.5 miles northwestward of Bay City, has practically been abandoned.

Bay City, about midway of the eastern shore of the bay, has a cannery. There is a controlling depth of about 7 feet to Bay City. Fishing and crabbing are carried on in this vicinity, but all shipments are made by truck or rail. There is 6 to 6½ feet alongside the wharf and large fishing craft land easily. Some fuel and oil are available.

Tillamook on Hoquarten Slough, is the principal town in the bay. It is the distributing center for a rich farming and dairying section and has communication by rail to Portland. There is but little water-borne commerce here. It is on the Oregon Coast Highway (U. S. 101), which has bus and freight service along the whole Oregon coast. Some logs are towed to Garibaldi or Miami Cove to make up rafts for towing to Aberdeen. The tall concrete stack of the shingle mill at Tillamook is prominent.

Supplies.—Gasoline, distillate, water, provisions, and a limited amount of ship chandlers' stores can be obtained at Tillamook and Garibaldi.

Repairs.—Facilities are limited to carpentry work and minor repairs to launch engines.

Communication is by rail to Portland, and by truck and bus to the Columbia River or San Francisco; there are telegraph and telephone facilities. The Oregon Coast Highway runs northward to Astoria and southward to California. It connects with Portland and points in the interior at Hebo and Tillamook.

Currents.—In the entrance, the average central surface velocity of the flood or ebb stream at strength is about 3 knots.

Directions.—No directions that would be of value to a stranger can be given. The

bar is subject to change, and inside the entrance, the aids to naviagtion are few, and local knowledge is necessary for following the best water in the channels.

Twin Rocks lie 700 yards offshore and 2 miles northward of the entrance to Tillamook Bay. This prominent feature is in reality two rocks, whose bases are so close together that they generally appear as one. The southern and larger one is 88 feet high and has an arch in it; the other is 73 feet high.

TILLAMOOK BAY TO NEHALEM RIVER

(CHART 5902)

From Tillamook Bay to the Nehalem River, the coast is nearly straight for about 4.5 miles. There are several lakes in this stretch separated from the beach by wooded sand dunes. The high hills begin to rise 0.5 mile to 0.8 mile from the beach and in 1 mile reach elevations from 1,000 to 1,600 feet; they are heavily wooded.

NEHALEM RIVER

(CHART 6122)

Nehalem River is a small stream which empties about 19.5 miles northward of Cape Lookout and 17 miles southward of Tillamook Rock Light. The tidal reach extends to a point about 10 miles from the entrance, above which the river is a mountain stream full of riffles and obstructed by boulders. The river constitutes a natural outlet for an extensive area of heavily timbered country. Lumbering and fishing are the principal industries. Sawmills and canneries are located at various points on the lower river.

Nehalem Beach, the northern point at the entrance, is a narrow sand spit, bare of trees, and with sand dunes of moderate elevation over the northern part. The southern side of the entrance is a low, broad, sand beach, backed by wooded country, rising to elevations of 400 feet.

The **entrance** has been improved by the Government by the construction of two jetties, but the depths on the bar and within the bay are not sufficient for coastwise shipping, and all lumber is now shipped out by rail. Log rafts in considerable numbers are towed out. The entrance is marked by a bell buoy.

In 1936 there was a controlling depth of 8 feet on the ocean bar, 13 feet between the jetties and 7 to 8 feet to Wheeler. In winter, the river cuts a channel usually about 12 feet deep straight out; in summer there is only about 8 feet. The channel is very changeable.

There is a swing highway bridge crossing the river just below Nehalem about 1,300 yards northward of **Deans Point.** The horizontal clearance on both sides of the center pier is 60 feet; the vertical clearance is 10 feet above MHW when closed. A highway bridge with about 8 feet vertical clearance at MHW is situated about 2 miles above the town on the northern fork of the river.

Brighton is a small settlement on the eastern shore, a mile inside the entrance. The sawmill and wharf are in ruins.

Hoevet and **Wheeler** form practically one continuous town on the southern bank of the river, 2.8 miles above Brighton. The old sawmill at Hoevet is in ruins and the wharf dangerous. There is a fish cannery at Wheeler with 6 to 8 feet at the wharf; a shingle mill is also at Wheeler. All traffic is by truck and rail.

Nehalem is a small settlement on the western shore of the river, about 1.5 miles above Wheeler. It has a cannery with 6 feet at the wharf.

Communication may be had by rail to Portland and Tillamook. The Oregon Coast Highway (U. S. 101) runs north and south along the coast, and connects with points in the interior at frequent intervals. There is no traffic by water at present except log rafts. There are telephone and telegraph facilities.

Directions.—No directions that would be of value to a stranger can be given. The entrance channel is subject to changes. Strangers should not attempt to enter before obtaining local information as to conditions. The bar should not be attempted in heavy weather.

NEHALEM RIVER TO CLATSOP SPIT

(CHART 5902)

Northward of the entrance to Nehalem River, the coast for 3 miles is low and sandy. It then increases in height and is covered with a dense forest, except in the vicinity of the beach, where there is a narrow line of grassy hillocks, 40 to 100 feet high, which rise gradually to the southern slope of Neahkahnie Mountain.

Cape Falcon, about 17 miles northward of Cape Meares and 10 miles southward of Tillamook Rock, projects about 2 miles from the general trend of the coast. The seaward face is less than 0.5 mile in extent, very jagged, with numerous rocks under the cliffs. The southwestern point of the cape is composed of nearly vertical cliffs, 200 feet high, and is partially bare of timber.

Falcon Rock, 15 feet high, small in extent and not very conspicuous, lies 0.7 mile westward of the southwestern point of the cape.

Smugglers Cove, the local name of a small bight just southward of Cape Falcon, is an excellent anchorage for small boats. The best anchorage is close to the northern shore in 4 to 5 fathoms, protected from all winds except from the southwestward. Care should be taken to avoid two rocks, bare at extreme low water, that lie 1,800 yards 99½° from Falcon Rock, about 150 yards from the north shore of the cove, and rise abruptly from the surrounding deep water. A plentiful supply of fresh water empties into the cove at the sand beach at the head of the cove.

Neahkahnie Mountain, 2 miles eastward of Cape Falcon, is a prominent landmark. It is double-headed, the western summit being rounded and 1,638 feet high, the eastern and lower summit serrated and divided into three peaks of nearly equal height. The entire southeastern slope is bare of timber and covered with grass and fern. The seaward face terminates in rocky, broken cliffs over 500 feet high, and there are a few rocks lying about 100 feet from the beach. The two summits are visible from southward; from northward, the western summit hides the eastern and is very conspicuous.

The coast northward from Cape Falcon consists of high cliffs, until 1.5 miles southward of Arch Cape, where they change to low bluffs.

Arch Cape is rocky and precipitous, and projects but little from the general trend of the coast; it is the termination of a mountain ridge rising to 2,775 feet, 3 miles eastward. The cape is bare of timber on the southern slope for a short distance from the point. A rock, 120 feet high, lies close under the cape, and is connected with it at low water; a smaller rock, 25 feet high, lies about 100 yards outside of this rock. There are several other high rocks in the vicinity of the cape.

Castle Rock, formerly known as **Arch Cape Rock,** derives its name from its remarkable resemblance to a medieval castle with two towers, the higher of which, 157 feet

high, is on the seaward end of the rock. It lies a little over 0.8 mile westward of the highest part of the cape, and is the outermost bare rock. The upper part of the rock is covered with bird droppings and shows up very distinctly when the sun is shining on it. A rock, awash, lies about 0.9 mile off the cape and 0.4 mile 225° from Castle Rock; another rock, bare at lowest tides, lies 0.5 mile offshore and 1 mile 174° from Castle Rock.

There is a narrow but deep channel between Falcon Rock and the shore, with a controlling depth of at least 10 fathoms. Falcon Rock should be passed close by and care taken to avoid the reef bare at extreme low water, the outer end of which is 850 yards 49° from Falcon Rock.

Northeastward of Cape Falcon, and from 2 to 3 miles back from the shoreline, is a group of peaks, among which is the most prominent and highest in the vicinity, with an elevation of 3,095 feet. It has a rounded summit, with a very gentle slope to the southward, and a more marked and abrupt drop to the northward, and is a very conspicuous landfall in clear weather, when viewed from the westward.

Hug Point is a small cliff close to the beach, 1.8 miles northward of Arch Cape; the cliffs in its vicinity are about 180 feet high.

Double Peak, halfway between Cape Falcon and Tillamook Head, is the seaward termination of a ridge extending eastward, which reaches a height of 1,000 feet in less than 0.7 mile from the shore. It is heavily wooded, and pitches abruptly to the sea, ending in a rocky, broken cliff 100 feet high and 0.2 mile long. A rock, 107 feet high, lies close to and abreast of the southern end of the cliff, and another, 76 feet high, lies close to and abreast the northern end. A ledge, showing two rocks bare at half tide, lies about a mile west-southwestward of the highest part of the cliff.

From Double Peak, the coast extends north-northwestward for 2.7 miles to the mouth of **Elk Creek,** and then turns sharply northwestward for the same distance to the western point of Tillamook head. The coast is high and wooded, with broken cliffs bordered by numerous rocks, except at **Cannon Beach,** at the mouth of Elk Creek.

Haystack Rock, 235 feet high, lies 1.5 miles northward of Double Peak. It is the largest of a cluster of rocks stretching out from the low-waterline to 10 fathoms.

A rock awash at low water and surrounded by a depth of about 9 fathoms lies 0.8 mile 247° from Haystack Rock.

Tillamook Head ends in a double point, the points being 0.5 mile apart. At the southern point, the cliffs are 560 feet high, and at the northern point, are 1,000 feet high. A pinnacle rock lies at the foot of the cliffs at the northern point, and extending offshore from it for 300 yards, is a cluster of rocks, 45 to 150 feet high, the outer one being the lowest. The summit of the head is 1,260 feet high, flat, and densely wooded, with slightly lower land behind it.

Tillamook Rock lies nearly 1.2 miles 268° from the southern point of Tillamook Head. It is nearly 100 feet high, and is marked by a light and buildings. The western face leans a little seaward. A rock, awash, lies between the rock and the nearest part of Tillamook Head.

Tillamook Rock Light* is shown from a white, square tower on a dwelling. The light is 133 feet above the water, and visible 18 miles. The light is displayed from 1 hour before sunset to 1 hour after sunrise. A fog signal is sounded on an air siren.

North of Tillamook Head, the coast is a broad, sand beach, extending for 17 miles to Clatsop Spit, the southern point at the entrance to the Columbia River. Low, sandy ridges, covered with grass, fern, and brush, extend parallel with and back of the

*Lat. 45°56′.2, Long. 124°01′.0: Chart 5902, 5052, 9000.

beach. **Necanicum River,** a small stream, empties at 2.5 miles from the southern end of this beach. Several hotels and summer resorts are situated along this stretch, and a sawmill, the smoke from which can generally be seen, is near the southern end.

Seaside is an important summer resort situated in the bight 3 miles to the northward of Tillamook Head. It has rail connections to Astoria.

Saddle Mountain, double-headed and 3,266 feet high, is the landfall for this section of the coast and in approaching the Columbia River. It lies 14 miles 82° from Tillamook Rock Light and is visible 50 miles offshore. From the northwestward, this mountain appears to be a triple-headed peak. The apparent northeastern peak, cone-shaped and sharp, is the lowest. The middle peak is irregularly cone-shaped, while the southern and highest peak is a flat-topped cone.

Chapter 13.—THE COLUMBIA RIVER

(NO CHARTS)

The deep channels for ocean vessels are shown on a set of seven, overlapping, large scale charts, covering the area from the entrance to The Dalles at the head of this type of navigation. They are numbered 6151 to 6157, inclusive.

The various places and features along both banks of the river are described as the river is ascended. When two features are opposite, the one on the southern bank will be described first

The **Columbia River** enters the Pacific in latitude 46°15′ N., and, with its tributaries, drains a large and productive territory. The lower portion of the river forms the boundary between the States of Oregon and Washington. Below the Cascades, the river flows through a canyon averaging about 5 miles in width between the high cliffs on each side; of this width, the river occupies about 1 mile, the rest being marsh, low islands, and lowland. Near the mouth, the river becomes wider, and in some places is 5 miles across.

This river and its tributaries are navigable by deep-draft ocean steamers to Portland, Vancouver, and The Dalles, 98, 92, and 164 miles, respectively, above the mouth, and by light-draft river steamers to Priest Rapids, Washington, and Lewiston, Idaho, 345 and 406 miles, respectively, above the mouth.

The commerce, both foreign and domestic, is extensive. The exports are principally lumber, grain, flour, fruit, fish, and general merchandise; the imports are coal, fuel oil, cement, manufactures, and general merchandise. There are numerous settlements and landings, but Astoria, on the south bank, 10 miles inside the entrance, and Portland, on the Willamette River, 9 miles from its junction with the Columbia, are the principal shipping points.

The **entrance** to the Columbia River has been improved by the construction of north and south jetties, and by dredging. The project depth is 40 feet between the jetties. In June 1940, the controlling depths were: The channel westward of the ends of the jetties, 40 feet; on the outer bar at the center, 45 feet; between the ends of the jetties, 46 feet at the center. †In _____, 19___, the controlling depths in the channel were: _____

_____.

The improvement makes it possible for the largest vessels on the Pacific to enter and leave at any normal stage of the tide, and in any weather except during the most severe storms. Bar-bound vessels, once so common here, are now rarely to be seen.

Extensive improvements have been made throughout the Columbia and Willamette Rivers from the sea to Portland. The project depth is 35 feet. The project depth between Vancouver and Bonneville is 27 feet. The channel between Bonneville and The Dalles is 30 feet as provided by the pool of the Bonneville Dam which extends 49 statute miles to Big Eddy.

Above the entrance, the project is attained partly by the construction of stone and pile dikes and revetments, but chiefly by dredging on the various bars. The project

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

depth has been obtained at various times, but on account of excessive shoaling during the annual freshets, it has been impossible to maintain that depth on all bars. A draft of 30 feet is practicable at low tide throughout the year and at higher tide, drafts of 32 to 35 feet are practicable. Weekly bulletins are issued at Portland giving depths and river stages at various points. In June 1941, the controlling depth between Vancouver and Bonneville was 27 feet.

Directions.—Because of the frequent changes in the position of certain portions of the dredged channel, no directions for the river can be given which would be of permanent value. These channels throughout, however, are well marked by ranges, beacons, and buoys, and by following the chart, vessels of less than 30 feet draft should have little difficulty in reaching Portland, provided the trip can be made in daylight. Darkness greatly increases the difficulty of navigation, not only because the unlighted aids cannot then be seen, but more particularly because the lighted aids are in some cases difficult to distinguish from the numerous other lights surrounding them. Strangers should not attempt to run the river at night.

Freshets occur annually, the high-water stage being reached about June. The heights above normal range from about 20 feet at Portland, to practically nothing at Astoria. These freshets cause shoaling in the dredged cuts through the various bars, but redredging is begun as soon as the waters have partly subsided, and normal conditions are restored shortly after the end of the flood season.

Ice forms occasionally in both the Willamette and Columbia Rivers, but it is seldom heavy enough to seriously affect navigation.

Salinity of river water.—The river water in the vicinity of Portland and as far downstream as Brookfield, Washington, is fresh and is used for boilers of steamers at all seasons of the year. From Brookfield to the sea, the salinity increases. In the vicinity of Astoria it is brackish.

A **Coast Guard station** is located on the eastern side of Point Adams. There is another Coast Guard station at Fort Canby on the eastern side of Cape Disappointment.

Mount St. Helens, nearly 10,000 feet high, cone-shaped and snow-capped, lies about 75 miles eastward of the entrance to the river. On a clear day it is visible when looking up the valley from seaward.

Mount Hood and **Mount Adams** are also lofty, snow-covered peaks, visible from parts of the Columbia River on a clear day.

Dredges will usually be found at work in the channels of the Columbia and Willamette Rivers. These dredges should be passed with caution and reduced speed.

Regulations governing navigation on the Columbia and Willamette Rivers, prescribed by the Secretary of War, are quoted as follows:

> Every steam vessel passing dredges or other plant, that may be employed on river improvement or at anchor, in the Willamette and Columbia Rivers, shall be navigated under a slow bell at a speed of not more than 6 statute miles per hour.

COLUMBIA RIVER ENTRANCE

(CHART 6151)

Point Adams, the southern point at the entrance, is a low, sandy point, covered with fir and undergrowth to the edge of the sand beach and low dunes. The point usually shows well from seaward, particularly if it is hazy inside.

Clatsop Spit is a low, sand beach, extending from Point Adams, a distance of 2.5 miles, toward Cape Disappointment. It was formerly subject to extensive shifting,

but the construction of the south jetty has fixed it in position, except that the shoal off Clatsop Spit has extended northwestward.

A **radio direction finder station** is located on Point Adams.

Cape Disappointment, the northern point at the entrance to the Columbia River, is the only headland on the low, sand beach that extends from Tillamook Head to Point Grenville, a distance of over 80 miles. It comprises a group of rounding hills covering an area 2.5 miles long and 1 mile wide, divided by a narrow valley extending north-northwestward. The seaward faces of these hills are precipitous cliffs with jagged, rocky points and small strips of sand beach. The extreme southeastern point is marked by a light.

Cape Disappointment Light is shown from a white conical tower. The light is 220 feet above water, visible 21 miles, and is obscured northward of 137½°. There is a radiobeacon at the light.

McKenzie Head, 0.8 mile northwestward of the light is 190 feet high and nearly round. It is covered with grass and fern, but is bare of trees.

North Head, the estreme western point of the cape, is 270 feet high, with a very jagged, precipitous cliff, backed by a narrow, grassy strip; the higher ground behind it is covered with trees.

North Head Light* is shown from a white conical tower on the western point of North Head. The light is 194 feet above the water, and visible 20 miles. The light is obscured east of 181°. Near the light there is a United States Weather Bureau **storm-warning display station,** with telegraph and telephone to Astoria and Portland, and equipped with international code signals for reporting vessels and receiving messages.

From the southward, Cape Disappointment shows as three low knobs, separated by low flat ridges. North Head Light shows on the western slope of the western knob. Cape Disappointment Light shows on the western slope of the eastern knob. From the westward, the cape is not prominent, but in fog, haze, or smoke inside the cape, it stands out clearly. From northwestward, the cape appears as a flat island with a slight depression in the center and a timbered knob at each end. From this direction, between the cape and high ridges eastward, appears a low, flat hill with gently sloping sides which from a distance appears as an island.

Columbia River Lightship is moored on the Main Channel range for entering Columbia River, and is 8.2 miles 213° from North Head Light. It has a red hull with COLUMBIA on each side and two masts. The light, shown from the foremast, is 67 feet above the water, and visible 14 miles. The fog signal is sounded on a steam diaphragm horn. The lightship has a radiobeacon equipped for distance finding; the station receives and transmits emergency radio messages. Storm warnings are displayed at the lightship during daylight hours.

Pilots.—Pilotage across the Columbia River Bar is not compulsory but pilots are always available. Vessels desiring a pilot should radio the Columbia River Bar Pilots, Portland, stating the probable time of arrival at the lightship. The pilot boat, which is a power schooner, flies the Union Jack at the mainmast; it is equipped with radiotelephone. The bar pilots also maintain an office at Astoria.

The **bar pilotage** ground extends from the uppermost dock or wharf at the port of Astoria or Knappton, to the open sea, at least 10 miles beyond the outermost buoy, and the **river pilotage** ground extends from the lowermost dock or wharf at the port of

*Lat. 46°18′.0, Long. 124°04′.6: Charts 5902, 6002, 6151.

Astoria to the head of navigation on the Columbia or Willamette Rivers and their tributaries.

The rates in 1941 were $1.50 per foot draft and 1 cent per net registered ton for bar pilotage with a minimum charge of $45.00 and $1.00 per foot draft and 1¼ cents per net registered ton for the river pilotage between Astoria and Portland. When a vessel outward bound takes a pilot, and is thereafter prevented from going to sea on account of stress of weather and the pilot remains thereon at the request of the master, such pilot is entitled to compensation therefor at the rate of $5.00 per day.

Information, condition Columbia River Bar.—An estimate of bar conditions, visibility, wind, etc., may generally be obtained by radio from the United States Coast Guard Cutter at Astoria, or the Point Adams Coast Guard Lifeboat Station at Hammond.

Currents.—The currents at the Columbia River Lightship are described on page —.

Caution.—The Columbia River Bar is said to be very dangerous because of sudden and unpredictable changes in the currents often accompanied by breakers. It is reported that ebb currents on the northern side of the bar attain velocities of 6 to 8 knots, and that strong northwesterly winds sometimes cause currents that set northward or against the wind in the area outside the jetties.

In the entrance the currents are variable, and at times, reach a velocity of over 5 knots on the ebb; on the flood they seldom exceed a velocity of 3½ knots. The mean velocity of the tidal current is about 3½ knots at strength of either flood or ebb, but this tidal current is always modified both as to velocity and time of slack water by the river discharge. On the flood, there is a dangerous set toward Clatsop Spit, its direction being approximately east by south; on the ebb the current sets along the line of buoys. Heavy breakers have been reported as far inside the entrance as buoy 12, southward of Sand Island.

For predicted times and velocities, the *Current Tables, Pacific Coast,* should be consulted.

DIRECTIONS, COLUMBIA RIVER APPROACH

From seaward, in clear weather, the landmarks are prominent, and the lights at the entrance, at Willapa Bay 28 miles northward, and on Tillamook Rock, 20 miles southward, are distinguishing marks for determining a vessel's position northward or southward of the entrance and the subsequent shaping of the course.

Approaching from any direction in thick weather, great caution is essential. The currents are variable and uncertain. Velocities of 3 to 3.4 knots have been observed at the lightships between Blunts Reef and Swiftsure Bank, and velocities considerably in excess of those amounts have been reported. For detailed information regarding the conditions which may be encountered and the precautions to be observed see the statement on coastwise navigation beginning on page 37. Under such conditions, vessels should keep outside the 30-fathom curve until the lightship has been made. Care should be taken not to mistake the low sand beach northward of Cape Disappointment for that southward of Point Adams. Nearly all the vessels which have gone ashore while endeavoring to make the entrance have been wrecked northward of the mouth of the river in the vicinity of Peacock Spit.

Sailing vessels should endeavor to make the land to windward of the entrance in the summer months, in the latitude of Cape Disappointment; and in winter, well southward of the cape; and when compelled to heave-to while waiting for favorable conditions for entering, particularly during the heavy weather of the winter season, should make

ample allowance for current. Vessels have been known to heave-to on making Columbia River Lightship and 24 hours later find themselves off Grays Harbor.

The use of radio direction finder stations and radio beacons.—In approaching the Columbia River entrance from the southward, good positions may be obtained after passing latitude 45° N.; from this point, the direction finder stations at Fort Stevens, Klipsan Beach, and the radio beacon at Destruction Island should be used. If well offshore, a course may be set directly for Columbia River Lightship. As the Lightship is approached, reliable fixes may be obtained, and in the vicinity of the lightship, bearings from Fort Stevens and Klipsan Beach only will be sufficient. These should carry the vessel directly to the lightship, but if this aid is not sighted, a bearing of 265° 30′ from Fort Stevens passes through the lightship, and this bearing may be used as a range in locating the lightship. Direction finder bearings will be of little value after reaching the Columbia River Lightship, and they should not be used in making the entrance. They may be of value in checking the vessel's progress through the channel but Klipsan Beach bearings are apt to be in error after passing inshore of the lightship.

In approaching the Columbia River entrance from the northward, Destruction Island and Klipsan Beach will carry the vessel well down to the entrance, and when bearing approximately 315° from Fort Stevens, this station and Klipsan Beach alone should be used in making the lightship. Here again the principal value of the direction finder stations lies in carrying the vessel to the Columbia River Lightship, the point of departure for running up the channel.

In approaching the Columbia River entrance on the great circle course from the Orient, bearings from Tatoosh Island, Destruction Island, and either Klipsan Beach or Fort Stevens will give approximate positions from about 200 miles to seaward, although the "triangle of errors" at this distance is apt to be large. From about 75 miles offshore, strong fixes may be expected and the approach to the lightship may be made without difficulty.

In clear weather, vessels should have no difficulty in entering the river, as the aids to navigation are numerous. The chart is the guide, and no detailed directions are necessary. In thick weather, however, when the aids cannot be seen, strangers should not attempt to enter without a pilot.

Local vessels entering in thick weather and with a flood tide, as a rule, do not attempt to pass beyond Desdemona Sands Light, because of the difficulty under such circumstances of avoiding vessels anchored in the narrow channel above the light.

Caution.—There is a tendency for Clatsop Spit Shoal to build up to the northwestward. Vessels are cautioned to keep informed as to conditions in this vicinity.

COLUMBIA RIVER ENTRANCE TO HARRINGTON POINT

(CHART 6151)

Baker Bay is a shoal, open bight, eastward of Cape Disappointment, formed by the cape and the recession of the land northward. **Sand Island,** low and flat, lies in front of the bay. A channel redredged to 10 feet in 1939 lies eastward and northward of the island. In July 1942, the controlling depth was 8 feet. This channel leads to **Ilwaco,** a small town on the northern shore. †In _____ 19 ____, the controlling depth in the channel was: _____. Ilwaco is the base for a large fishing fleet. Fuel oil, gas, and water are available; there are facilities for hoisting out 8- to 10-ton

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

fish boats on small marine railways and for making some repairs. There is another channel of shoal depths to the westward of Sand Island. The remainder of the bay is covered with shoals and old, abandoned fish traps, and at low tide, is not navigable even for light-draft river steamers.

For Point Adams see page 214.

About a mile eastward of Sand Island and the end of Clatsop Spit, the channel is divided by the shoal, **Desdemona Sands.**

Desdemona Sands Light* is shown from a white pyramidal tower on white piles on the western end of the shoal. The light is 36 feet above water, and visible 11 miles. A fog signal is sounded on an air diaphragm horn.

Warrenton, on the Skipanon River, has several sawmills, canneries, and fertilizer works. The **Skipanon River** has a project depth of 30 feet from deep water to and including the turning basin at Warrenton; thence 6 feet deep for a distance of 4,500 feet, via the cut-off channel, above the railroad bridge. In July 1942, the controlling depth was 24½ feet in the channel and 16 to 19 feet in the turning basin. In 1941, the controlling depth was 6 feet from the railroad bridge at Warrenton to the head of project above the railroad bridge. †In _____ 19 ____, the controlling depths in the channel were: _____

_____.

Ocean vessels load here regularly. Warrenton has rail connections with Astoria.

Scarboro Hill, 676 feet high, is on the northern bank of the river, inside the entrance, about 7 miles eastward of Cape Disappointment. It is a long, gradually rising ridge, covered with grass and fern. Formerly it was prominent, being the only grass-covered hill visible on the northern bank of the river. In recent years, however, many scattered trees have grown up on the hill, and the slopes eastward to Point Ellice have been largely denuded of their dark timber. A number of conspicuous light-colored buildings, belonging to the military post of **Fort Columbia,** may be seen near the base of the hill, and alongshore to the westward, lies the town of **Chinook.**

Smith Point, on the southern bank, at the junction of Young Bay and the river, is the western termination of a high, wooded ridge; it is the first prominent point on the southern bank southeastward of Point Adams. The ridge culminates in **Coxcomb Hill,** 647 feet high, behind Astoria. The Astor Column on top of the hill is prominent.

Youngs Bay, on the southern side of the river, about 10 miles inside the entrance, is shoal; it receives the waters of **Youngs River** and **Lewis and Clark River.** Traffic on these two rivers is confined chiefly to towboats handling log rafts from rafting grounds just above the two highway bridges. Small towboats operate to the town of **Olney,** but only at high tide, as the channel is reported to be practically dry at low tide. The portion of the bay southeastward of Smith Point is under improvement intended to provide additional frontage for the city of Astoria. The shipyards of Youngs Bay are no longer in operation. A power house with a prominent white concrete stack is located on the northern shore of the bay, just westward of the highway bridge. On the eastern side of the highway bridge at its northern end, are the moorings of the Astoria Yacht Club.

The project for Youngs Bay and River provides for a channel 10 feet deep from the Columbia River to the foot of **Haven Island.** In June 1941, the controlling depths were 9 feet below the highway bridge and 10 feet to Haven Island; thence about 4 feet for

*Lat. 46°13.′5, Long. 123°57.′2: Charts 5902, 6002, 6151.

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

1.5 miles to the head of navigation. †In _____ 19 ____, the controlling depths in the channel were: _____

_____

Youngs Bay is crossed by a railway and a highway bridge. The railway bridge has 130 feet width of openings; vertical clearance when closed is 10.5 feet. The signal for opening is one long blast of the whistle, followed quickly by one short blast. The highway bridge has 150 feet width of opening; the vertical clearance when closed is 6 feet. The signal for opening is one long blast followed quickly by two short blasts. The Lewis and Clark River is crossed by a highway bridge with a draw span of the bascule type, having an opening of 87 feet clear and a vertical clearance, when closed, of 5 feet. The signal for opening is 1 long blast, followed by 3 short blasts.

Astoria, on the south bank of the river, about 10 miles inside the entrance, extends from Youngs Bay to Tongue Point. It is the principal city on the lower portion of the river, and is of great and increasing commercial importance. It has connection with the interior by both rail and river steamers, and ships large quantities of grain, lumber, and general merchandise to both foreign and domestic ports. There are ample wharfage facilities, both municipal and private, with depths of 20 to 35 feet.

A mooring basin for trolling boats (and others) is maintained by the Port of Astoria just eastward of its 3 piers at Smith Point. Two hundred and twenty-five berths are available for vessels of about 40 feet length and 6 feet draft, at a charge rate of ten to fifteen dollars a year. A few larger berths are available.

Towboats.—Towboats are always available.

Quarantine.—National regulations are enforced by the Public Health Service. The quarantine officer is stationed at Astoria. Vessels subject to quarantine are boarded at Smith Point, or proceed to the upper anchorage opposite the Astoria waterfront; vessels destined for Portland, arriving in Astoria at night, proceed to the inspection station maintained below municipal terminal No. 4 at Portland.

Customs.—The river is in the Oregon collection district, of which Portland is the headquarters. The port of entry for the river is at Astoria, with offices in the Federal Building.

Immigration Service.—There is an office of the Immigration Service in the Federal Building, Astoria.

Marine hospital.—A relief station of the Public Health Service, in charge of service officers, is located at Astoria.

Anchorage.—There are no prescribed anchorage grounds off Astoria. Satisfactory anchorage is found just above Astoria and westward of Tongue Point on both sides of the main channel. There is a harbor regulation that no vessel shall anchor for more than 1 hour within the following area:

On the west, by a line drawn between Cannery Light (Elmore Cannery Wharf, Astoria) northwesterly to Black Can Buoy 21 in the north side of the ship channel; thence eastward in a straight line to Black Can Buoy 23; thence in a straight line to Astoria Harbor Lighted Buoy 25; thence southward in a straight line to Red Nun Buoy 2; and finally approximately 180° to Ferry Point Range.

Harbor regulations are prescribed by the Port of Astoria Commission and enforced by the **harbor master.** Copies of the complete regulations may be obtained from the harbor master.

Tides.—The mean range of tide at Astoria is 6.4 feet. The range between mean lower low water and mean higher high water is 8.1 feet. A range of about 12.5 feet may

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

occur at the time of maximum tides. Daily tide predictions for Astoria (Tongue Point) are given in the tide tables, published annually in advance by the United States Coast and Geodetic Survey.

Currents.—Abreast of Astoria, the ebb current has less velocity in the south channel than in the north channel. Above Astoria, the current averages 1 to 3 knots except during the freshet period, when the ebb is considerably increased although not enough to effect navigation seriously.

Wharfage and **Dockage** or **Berthage** are charged at Astoria.

The Port of Astoria, a municipal corporation embracing all of Clatsop County, 8,840 feet of the waterfront at Smith Point, and has built and operates a well-equipped modern terminal of three piers.

Supplies.—Coal, fuel oils, provisions, and ship chandlery may be obtained at Astoria.

There is a **chart agency** of the U. S. Coast and Geodetic Survey situated here.

Lighterage.—There are barges of various sizes available at all times.

Salvage.—Complete salvage equipment is available at Astoria.

There is a United States Coast Guard Cutter stationed at the port during the greater part of the year and is available to render assistance to vessels off the Oregon and Washington coasts.

Repairs.—There are no facilities for extensive repairs at Astoria. There are machine shops and foundries, but no drydock.

Communication between Astoria and Portland and intermediate points may be had by rail and river steamers, and with points northward and southward by rail and coastwise steamers. Several transcontinental railroads pass through Portland, and lines of steamers across the Pacific and through the Panama Canal call at Astoria and Portland. There is communication by telegraph, telephone, and radio. Astoria is on the Columbia River Highway which extends from Seaside, Oregon, to Astoria, thence along the southern bank of the Columbia to The Dalles. Astoria is on the Oregon Coast Highway.

Port Series No. 32 covers the port of Astoria.

Storm warnings are displayed by the United States Weather Bureau from a steel tower back of Astoria; both day and night signals are displayed here. Day signals are displayed at Point Adams and from the Columbia River Lightship. Day and night signals are also displayed from a tower at North Head, the northern entrance to the river.

Reporting station.—Vessels are reported to Astoria and Portland from a reporting station at North Head.

Point Ellice, on the north bank of the river, is the termination of a spur from the mountain ridge back of Scarboro Hill; it lies about 4 miles northeastward of Point Adams. The point is rounding and rocky, but not high. Two hillocks lie behind the point; one is 240 feet high and the one behind it is much higher. The shore in this vicinity is closely built up with abandoned fish traps, pile structures extending well out into the river.

Megler, a ferry landing on the northern shore opposite Astoria, about 1 mile northeastward of Point Ellice, is connected by ferry with Astoria as part of the coastal highway route.

There is a lumber wharf at **Knappton** 675 feet long, with a depth alongside of 33 feet at the lower end and 17 feet at the upper end. Vessels drawing up to 30 feet come to this dock. There is ferry service with Astoria.

Tongue Point, on the southern bank, about 4 miles east-northeastward of Smith

Point, is a bold, rocky peninsula, 308 feet high, covered with trees and connected with the southern bank by a low, narrow neck; it projects into the river for 0.8 mile. A buoy depot of the Coast Guard is situated on the western side of the peninsula near its inner end. On the eastern side of the peninsula, opposite the lighthouse depot, is the naval base site. Four short piers have been constructed here and some dredging has been done.

Cathlamet Bay lies eastward of Tongue Point and southward of the Main Ship Channel. There are many islands which are covered with tule in the summer, while in the winter they are almost undiscernable. The **John Day Channel** lies between Tongue Point and **John Day Point.** At the junction with the **John Day River,** just northward of the point, the name changes to **South Channel,** and it follows the shore closely to and around **Settler Point** to **Svensen.** These channels are marked and the aids are shown on the chart. The westerly portions of Prairie and Woody Island Channels cross the bay; they are marked, but due to their shifting character, the aids are not shown on the chart. Strangers should obtain local information as to conditions before navigating these channels.

Grays Bay extends from **Grays Point** to **Harrington Point** and northward of the Main Ship Channel. There are extensive mud flats in the northeastern section of the bay. **Deep River** flows into the northern part of the bay. The channel to this river is marked and follows the shore from Grays Point around **Portuguese Point** and **Rocky Point.** In June 1941, the controlling depth in Deep River to the town of Deep River was 7.5 feet. In June 1941, **Grays River** had depths of 2 feet for 6.5 miles and above that, to the town of Grays River, 1.5 miles farther up, it was practically dry in two places at low water. †In _____ 19____, the controlling depths in the channel were:

_____

_____

These two rivers are used chiefly by fishing boats and for log rafts.

HARRINGTON POINT TO CRIMS ISLAND

(CHART 6152)

In this section of the river, the main channel follows the northern bank to **Three Tree Point;** thence swings around the bend, holding to the northeastern shore to **Hunting Islands;** thence swings southward across **Puget Island Bar** and follows the southerly shore until off the southeastern end of **Puget Island;** thence follows the northerly bank from **Cape Horn** past **Abernethy Point** and northward of **Crims** and **Gull Islands.** Eastward of Puget Island Bar there are numerous detached jetties, most of which are marked by lights and beacons at their ends.

Local magnetic attraction.—Differences from the normal variation as much as 2° have been observed along this section of the Columbia River, between Harrington Point and Crims Island.

The easterly end of **Woody Island Channel** enters the main channel northward of **Woody Island. Prairie Channel** follows the northern shore of **Long Island** to Woody Island. **Blind Slough** and its tributary, **Grizzly Slough,** on the southern side of Long Island, are used for log raft storage. **Steamboat Slough,** northeastward of **Price Island,** is used by small river steamers stopping at **Skamokawa** for miscellaneous freight and by fishing boats; it has a least depth of 13 feet.

Elokomin Slough, on the western side of Hunting Islands, is used for log storage and by tow boats towing barges from a chipping mill in the slough to paper mills up the

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

river. It has a depth of 10 feet from the eastern end to the wood mill; there is a turning basin of the same depth in front of the box factory and chipping mill; the western end has depths of 1 foot near the mouth.

Clifton Channel separates **Tenasillahe Island** from the western bank of the river. There is a log pond at **Bradwood** where this channel joins the main channel.

Cathlamet Channel is used by small river steamers and by log rafts or barges, and for some log storage above the city of **Cathlamet;** 10 feet can be carried readily. A fixed span highway bridge crosses the channel from Cathlamet to Puget Island; the central section has a horizontal clearance of 400 feet and a vertical clearance of 74.6 feet at low water. **Westport Slough** is used by ocean-going steamers to **Westport.** In 1939, a depth of 30 feet could be carried to the Westport Lumber Company. East of Westport, the slough is used for log storage, and about 8 feet can be carried to **Kerry,** 1.5 miles above Westport. There is a ferry between Westport and **Pancake Point** on Puget Island.

Wallace Slough, southward of **Wallace Island,** is used at the eastern end, to the cannery at the mouth of the canal from Clatskanie, by cannery tenders, and also, by fishing boats and house floats, from there west. A depth of 4 or 5 feet can be carried through the slough. **Beaver Slough** enters Wallace Slough at the mouth of the canal and is used by fishing boats and float houses. In June 1941, the controlling depth in **Clatskanie Creek** to **Clatskanie** was 3 feet.

Bradbury Slough, southwestward of Crims Island, had depths of 7 to 8 feet in 1938, and is used by cannery tenders and fishing boats. It is practically closed at the upper end at low water.

CRIMS ISLAND TO ST. HELENS

(CHART 6153)

The main channel swings southeastward, passing southward of **Fisher Island** and northward of **Walker Island;** thence, under the Longview Bridge, which has a vertical clearance of 167 feet; thence, swings westward of **Cottonwood Island,** eastward of **Sandy Island,** westward of **Martin** and **Burke Islands.** The numerous jetties, some of which are detached, have for the most part lights and beacons at their ends.

Local magnetic attraction.—Differences from the normal variation as much as 2° have been observed along this section of the Columbia River.

Coal Creek Slough enters the river at **Stella.** The slough is used exclusively for log raft storage. A depth of 14 feet controls at the entrance, but 19 feet may be carried to within 0.5 mile of the eastern limits, where the channel quickly shoals to a few feet.

Fisher Island Channel, northward of Fisher Island, is used by cannery tenders and small fishing craft, and as log storage grounds. A depth of 8 feet may be carried through this channel.

The channel between Walker Island and the Oregon shore is used for log raft storage. The shoal area, northward of **Dibblee Point,** limits the maximum depth which may be carried through the entire channel to about 10 feet. This channel is used as a short cut by river boats during freshets.

Mount Coffin, formerly 248 feet high, is being quarried away. In 1941, it was about one-half its original size.

Rainier, on the Oregon shore, has some ocean commerce in lumber and other wood products.

Longview, just westward of the mouth of the Cowlitz River and opposite Rainier,

is built around the activities of an extensive lumber development. The port of Longview owns and operates a general cargo wharf which has 1,887 feet of berthing space with a depth, alongside, of from 25 to 35 feet. There are also large lumber wharves with 30 feet alongside, and a large grain elevator with wharf for ocean vessels. Ocean-going vessels load lumber here for export and intercoastal trade. Fresh water, fuel, and diesel oil may be obtained in any quantity.

Towboats are available from either Kelso or Rainier. No repair facilities are available.

Port Series No. 32 covers the Port of Longview.

Two large sawmills and a paper mill on the riverfront have numerous stacks, tanks, and incinerators, all conspicuous from the river.

The **Cowlitz River** flows into the Columbia just eastward of Longview. The channel has a depth of 4 feet to **Ostrander,** 9 miles above the mouth; thence 2.5 feet for 25 miles to **Toledo**. In June 1941, the project depths were obtained to the mouth of the **Toutle River,** 20 miles above the mouth. †In _____ 19___, the controlling depths in the channel were: _____ _____. At **Kelso,** there are a number of private wharves and one public landing. Above Kelso, there are two log dumps. Considerable amounts of lumber, farm, and dairy products are shipped.

Between the mouth and Ostrander, there are four bridges. The first is a railroad bridge having a single leaf bascule span with a horizontal clearance of 107 feet, and a vertical clearance of 7 feet above MHW, when closed. The second is a fixed highway bridge with a horizontal clearance of 235 feet, and a vertical clearance of 59 feet above MHW. The third is a vertical lift span, between Longview and Kelso, with a horizontal clearance of 100 feet, and a vertical clearance of 47 feet above MHW. Above Kelso is a fixed railway bridge with a horizontal clearance of 227 feet, and a vertical clearance of 46 feet above MHW.

Carroll (formerly **Charlton**) **Channel,** between Cottonwood Island and the Washington shore, is used for log storage and fishing boats. In 1938, 13 feet could be carried through the channel.

Kalama River is used chiefly at its mouth by smelt fishermen.

Kalama, on the eastern bank, is an occasional stop for ocean-going vessels to pick up lumber. There is a ferry between Kalama, and **Goble** on the western bank.

The channel on the western and southern sides of Sandy Island was good for 14-foot draft in 1938, and was used by tow boats with log rafts and barges.

Martin Slough, between Martin Island and Burke Island and the Washington shore, is used in log rafting operations. **Burke Slough** between Burke Island and the Washington shore is also used for that purpose.

Saint Helens is situated 75 miles above the mouth and opposite the mouth of the Lewis River. There are paper and lumber mills, the products of which are shipped in considerable quantities.

Lewis River enters the Columbia at **Austin Point** eastward of Saint Helens. The project provides for a channel 6 feet deep to the mouth of the East Fork; thence 4 feet deep on the East Fork to La Center; and 4 feet deep in Lewis River, North Fork, from the East Fork to **Woodland.** In June 1941, the controlling depth to La Center was 1 foot, and to Woodland, 2 feet.

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

SAINT HELENS TO WILLAMETTE RIVER

(CHART 6154)

The main channel follows a southerly course. **Sauvie Island** on the west bank, separates Multnomah Channel from the main channel. **Bachelor Island** is on the eastern side opposite the upper part of Sauvie Island. Vessels seldom attempt to pass Warrior Rock Light in a thick fog, anchoring either above or below this point until the weather clears.

Warrior Rock Light, near the northern end of Sauvie Island, and one of the few watched lights on the upper river, is shown from a white pyramidal structure on a stone pier. The light is 24 feet above water. A fog signal is sounded on a bell, operating continuously except that it is not sounded from June 1 to August 31, each year.

Local magnetic attraction.—There is reported to be a marked magnetic disturbance between Warrior Rock Light and **Duck Club Light.** This amounts to as much as 6°.

Multonomah Channel, on the western side of Sauvie Island, is an important waterway, used by log and hog fuel-tows, and also by small river steamers during the winter months, when the main channel is discharging floe ice. The channel is also an important log raft storage grounds. A channel 25 feet deep extends for a distance of 5,000 feet from the Columbia River, and a channel of the same depth extends 9,500 feet from the Willamette River. In June 1941, the controlling depths were 25 feet in the ends of the channel, and the depth in the remainder varied from 8 to 50 feet. †In _____ 19___, the controlling depths in the channel were: _____

_____

Lake River enters the Columbia at the northern end of Bachelor Island. There is a 6-foot channel to **Ridgefield;** in June 1941, the controlling depth was 6.5 feet. †In _____ 19___, the controlling depth in the channel was: _____. There are four wharves at Ridgefield. The principal traffic is floated logs, which are placed in the river from a log dump at **Felida.**

Bachelor Island Slough is a little used channel, being only 1 foot deep in places. It is used by boats from farms on Bachelor Island to Ridgefield.

WILLAMETTE RIVER

(CHART 6155)

The **Willamette River** is the largest tributary of the Columbia below the Cascades, and empties into the Columbia about 87 miles above the mouth. It has been extensively improved by the Government and by local dredging. The project provides for a channel 35 feet deep, about 12 miles to Portland; thence, 8 feet deep to **Oregon City,** 23 miles above the mouth; thence, through the locks at **Willamette Falls** with useable dimensions of 175 feet by 37 feet, with a depth on the sill of the upper lock of 6 feet; and thence 2½ feet to 3½ feet deep to **Corvallis,** 115 miles above the mouth. In June 1940, the controlling depths were: 34 feet to Portland; 8 feet from Portland to Oregon City; 6 feet over the sill of the upper lock; 3 feet from Oregon City to Spring Hill; and 1 foot

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

from Spring Hill to Corvallis. †In _____ 19___, the controlling depths in the channel were: _____

_____.

The **Willamette River Light** is located on the end of the dike at the eastern side of the entrance to the river at **Kelly Point.** The light is shown from a house painted with black and red horizontal bands, on a white pile structure, 24 feet above water. A fog signal is sounded on an electric bell; the signal is not sounded from June 1 to August 31.

Portland, on the Willamette River about 9 miles from its mouth, is the principal city of the Columbia River valley. It has extensive commerce, both foreign and domestic, and is the port of call for many lines of coastwise, intercoastal, and trans-Pacific steamships.

Pilots.—See page 215.

Towboats.—Towboats are always available.

Quarantine.—Officials of the Public Health Service in charge of the enforcement of quarantine regulations on the Columbia River are stationed at Astoria. Vessels destined for Portland, arriving at Astoria at night, proceed to the inspection station maintained below municipal terminal number 4 at Portland. Vessels may be fumigated at either Astoria or Portland.

Customs.—The headquarters of the Oregon Customs district is in Portland. The Customhouse is located at the corner of 8th and Davis Streets.

Immigration.—The headquarters of the immigration service is located in the Post Office Building.

Marine Hospital.—A relief station of the Public Health Service is located in room 215, United States Customhouse.

Anchorages.—The anchorages generally used are as follows: (a) From Broadway Bridge to the head of Swan Island Airport, a distance of 8,000 feet, having depths of 30 to 35 feet; (b) From the lower end of Swan Island Airport to the lower limits of the city, a short distance below municipal terminal No. 4, a distance of 21,000 feet, with depths of 25 to 35 feet.

The administration of the port of Portland is vested primarily in the municipal corporation known as the **"Port of Portland",** which has general jurisdiction over the physical development of the harbor and its channels, between the Broadway and Ross Island Bridges; and, in the **Commission of Public Docks,** with jurisdiction over the construction and operation of municipal water terminals. The Portland district of United States Engineers has jurisdiction over channel maintenance and improvement below the Broadway Bridge and above the Ross Island Bridge. The Port of Portland has jurisdiction, through the city, of a strip along each side of the river extending to 50 feet outside of the harbor lines. The Port of Portland was established by the state legislature, while the Commission of Public Docks is a department of the city.

The various regulations are enforced by the harbor master, and complete copies of the regulations may be secured from his office.

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

Bridges.—The Willamette River in the vicinity of Portland is crossed by 9 bridges as listed in the following table.

Miles above mouth	Location	Owner	Fixed, swing, vertical lift, etc.	Number of spans	Channel span: Clear width: Left	Channel span: Clear width: Center	Channel span: Clear width: Right	Channel span: Clear height, lowest point of superstructure above—: M.L.W.	Channel span: Clear height, lowest point of superstructure above—: H.W.	Purpose for which used
5.2	Philadelphia Street	Multnomah County	Fixed	1	----	1207	----	205	185	Highway.
6	St. Johns district	Spokane, Portland & Seattl Ry.	Swing	5	230	----	230	55	35	Railway use only.
10.2	Broadway	Multnomah County	Bascule	3	----	250	----	90	70	Highway and street cars.
10.5	Glisan Street	Oregon-Washington Railroad & Navigation Co.	Vertical lift	3	----	205	----	(1)	(2)	Trains, highway, and street cars.
10.8	Burnside Street	Multnomah County	Bascule	3	----	209	----	64.8	44.5	Highway and street cars.
11.1	Morrison Street	---do	Swing	4	157	----	157	33	13	Do.
11.3	Madison and Hawthorne Streets.	---do	Vertical lift	6	----	200	----	(3)	(4)	Do.
12.1	Foot of Ross Island	---do	Fixed	5	----	490	----	120	99.7	Highway.
14.3	Sellwood district	---do	---do	4	----	270	----	74.6	54.3	Do.

[1] Lower deck closed, 26 feet; open, 72 feet; both open, 164 feet.
[2] Lower deck closed, 6 feet; open, 52 feet; both open, 144 feet.
[3] Closed, 50 feet; open, 164 feet.
[4] Closed, 30 feet; open, 144 feet.

Bridge regulations.—The following are part of the regulations prescribed by the Secretary of War governing the opening of bridges across the Willamette River at Portland:

1. *Call signal* shall be as prescribed for each bridge in paragraph 2 of these regulations. It is given by vessels as notice to bridge operators to open the draw, or in case the draw is already open, that they intend to pass through. A call signal given twice in rapid succession indicates that vessel has authority to pass bridges during closed periods. (See par. 12.)

Acknowledging signal shall be the same as the call signal for each bridge. Its purpose is to acknowledge the call signal of a vessel and to indicate that the operator intends to open the draw as soon as practicable, or that he will hold it open.

Danger Signal shall consist of a series of short blasts, at least four, given in rapid succession, and repeated if necessary. Its purpose is to answer the call signal of a vessel, but to indicate that the *draw cannot or will not be opened at once*, or, when vessels are waiting in the vicinity, that the draw, if open, is about to be closed. It is also to be used *in emergency to revoke* an acknowledging signal.

Rescinding signal shall be the reverse of the call signal for each bridge. It is given by a vessel to cancel a previous call signal, to indicate that the vessel does not intend to pass through and that the draw need not be opened, or may be closed.

Answer by the bridge operator to a rescinding signal shall be the danger signal. (See above.)

2. The following *call signals* are prescribed for vessels wishing to have the draw spans opened or held open:

"Spokane, Portland and Seattle Railway Bridge", at North Portland Harbor (Oregon Slough), *one long* followed by *three short blasts.*

"Spokane, Portland and Seattle Railway Bridge", at St. Johns, Oreg., *one long* followed by *one short blast.*

"Broadway Bridge", *two long* followed by *one short blast.*

"Oregon-Washington Railroad and Navigation Co. Bridge", *one long* followed by *one short blast.*

"Burnside Bridge", *one long* followed by *two short blasts.*

"Morrison Bridge", *one long* followed by *three short blasts.*

"Hawthorne Bridge", *one long* followed by *four short blasts.*

Call signals may be given on any form of whiste, horn, siren, or trumpet with sufficient range to be heard by bridge operators.

* * * * * * * * *

4. A vessel, desiring at any time (except during closed periods, see par. 12) to pass through any of the above-mentioned bridges, under which it cannot pass with the draw closed, shall sound the call signal for such bridge as prescribed in paragraph 2 of these regulations, and shall repeat signal at intervals until it is answered by the operator of the bridge. (See pars. 1 and 8.) In case two vessels approaching from opposite directions would meet at or near the bridge the vessel bound down stream shall be considered as having the right-of-way. When either vessel waits for passage of the other it shall again give the call signal for the bridge and receive acknowledgment before proceeding. It is incumbent upon navigators to make sure that their signals are understood before proceeding through a draw span, and when approaching bridges, vessels should be kept under control, with a view to stopping, before reaching the bridge.

5. Vessels authorized to pass through bridges during closed periods as provided in paragraph 12, shall sound the call signal twice in rapid succession. Signals to open shall be given by vessels at a distance of at least 1,000 feet from the bridge, except in case of a vessel leaving a wharf or anchorage or when waiting less than 1,000 feet from the bridge. In such cases the signal shall be given early enough to allow the operator of the bridge sufficient time in which to clear and open the draw before arrival of the vessel.

6. All vessels when passing any bridge shall be moved as expeditiously as is consistent with established rules governing speed in the harbor of Portland, and all tow boats engaged in handling other craft or in towing logs through any of the bridges shall be of sufficient power to handle the tow without unduly delaying the closing of the draw span.

7. Vessels with hinged or adjustable masts or booms projecting above their fixed structures, shall lower same and pass under the bridge if practicable, without signalling for the draw to open.

8. If the bridge *can* be opened, or is already open, when a call signal is given, the operator shall promptly answer the vessel calling by giving the acknowledging signal, and promptly open the draw (except during closed periods, see par. 12), or hold it open, as the case may be.

9. In case the draw *cannot* be opened at once when the call signal is given, the operator shall promptly anwser the vessel calling by giving the danger signal, and shall repeat same, if necessary. As soon as the exigency which prevented opening has been removed the bridge operator shall promptly sound the regular acknowledging signal for that bridge to advise vessels that the draw can be opened at once, and he shall thereupon proceed to open same if there is a vessel waiting to pass through.

10. When two vessels arrive at a bridge at or near the same time and blow the call signal, lift spans, when opened, shall be raised high enough to clear the taller vessel. If either vessel at any drawbridge waits for passage of the other and again gives the call signal, the bridge operator shall promptly answer with the acknowledging signal and shall hold the span open. In case the intentions of a waiting vessel are not understood by a bridge operator, when the draw is open, he shall sound the danger signal as a warning to vessels that he is about to close the draw.

11. If a rescinding signal is given by a vessel to cancel a previously given call signal, and it is evident the vessel does not intend to pass through, the bridge operator shall answer with the danger signal (four or more short blasts) and may then close the draw, or need not open it.

12. The periods from 7:30 to 9 a.m. and 4:45 to 6:15 p.m. are hereby designated *closed periods* during which the draw spans of bridges carrying street traffic over Willamette River at Portland shall not be opened to navigation except as below provided, or when necessary to prevent accident.

Closed periods above defined shall not be effective on Sundays, New Year's Day, Washington's Birthday, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day, and Christmas Day, or days observed in lieu of these under State law.

Provided that closed periods shall not apply against harbor patrol or fire boats answering calls, nor ocean-going vessels of 750 gross tons or over which are entering the harbor from points outside Willamette River; and provided, further, that upon securing the approval and permission of the harbor master, but not otherwise, other ocean-going vessels of 750 gross tons or over may signal for and pass through these bridges at any hour. Vessels desiring and authorized to pass through bridges during closed periods as above provided, or in case of emergency when opening of the draw is necessary to prevent accident, shall sound the call signal twice in rapid succession, i.e., with an interval of not over 5 seconds between signals. Draw spans shall be opened, however, for ocean-going vessels of 750 gross tons or over under the rule in paragraph 8 above whether the vessel gives a single or double call signal.

13. These regulations shall be in force on and after *March 1, 1930*, and shall supersede all previous Federal regulations for the bridges to which they are applicable.

Dockage.—A dockage charge is assessed for the use of berthing space when the vessel is not engaged in loading or discharging cargo.

Wharfage is charged on all freight.

Wharves.—There are wharves capable of handling the largest ships plying the river, with storage facilities of all types available.

Supplies.—Fuel oil, coal, water, provisions, and ship chandlery may be had in any quantity.

There is a **chart agency** of the U. S. Coast and Geodetic Survey situated here.

Lighterage.—There is practically no lighterage service performed at this port. In view of the practice which prevails of moving vessels to various berths as required to load or discharge, the necessity for lighterage transfers has been minimized. There is, however, a transfer of lumber in barges from mills to vessels, for overside loading.

Salvage and wreckage.—There are no wrecking or salvaging facilities available at Portland, except for minor operations of this nature.

Repairs.—Repairs of all kinds can be made in Portland.

Communication between Astoria and intermediate points may be had by railroad and river steamers, and with points to the north and south, by railroad and ocean-going steamers. Several transcontinental railroads pass through Portland. There is also communication by telegraph, telephone, and radio.

A **United States Branch Hydrographic Office** is located in the United States Courthouse. Bulletins are posted here giving information of value to mariners, who are also enabled to avail themselves of publications pertaining to navigation, to compare barometers, and to correct their charts from standards. No charge is made for this service.

Other federal activities are given in tables in the Appendix.

Port Series No. 11 covers the port of Portland.

Yacht clubs.—A list of larger yacht clubs on the Pacific Coast is given in the Appendix.

Prevailing winds.—During the months from November to February inclusive, the prevailing winds in the vicinity of Portland are from the southward or southeastward; for the remainder of the year, northwesterly winds prevail.

Ice.—Ice forms occasionally, but it is seldom heavy enough to seriously affect navigation, although navigation by small vessels and river boats may be rendered difficult.

The **Yamhill River** empties into the Willamette River about 37 miles above Portland. A project provides for a channel in the Yamhill River, 4 feet deep from its mouth to **McMinnville,** about 16 miles above its mouth. There are a lock and dam 1.5 miles below **Lafayette,** about 7 miles above the mouth. The useable lock dimensions are 175 feet by 38 feet. In June 1940, the controlling depth was 2 feet to McMinnville.

WILLAMETTE RIVER TO VANCOUVER

(CHART 6155)

The main channel of the river lies between **Hayden** and **Tomahawk Islands** and the Washington shore. It is crossed by two bridges between Vancouver and Hayden Island. The first, a railroad bridge, has a swing span with a horizontal clearance of 200 feet and a vertical clearance of 19 feet above high water when closed; the signal is one long and one short blast. The second, the Interstate Highway Bridge, has a vertical lift span with a horizontal clearance of 250 feet and a vertical clearance of 154 feet above high water when raised; the signal is two long and 1 short blasts.

North Portland Harbor is that portion of the river channel between the Oregon shore and Hayden Island.

Vancouver is situated on the northern bank of the Columbia River, 92 miles above its mouth. Its importance as a port is due primarily to the fact that it constitutes a water outlet for a large lumber producing section in southwestern Washington, as well as distributing point for a fair share of the wheat produced in the interior of Washington and Oregon. The channel as far as the Interstate Highway Bridge has a project depth of 30 feet, with 2 turning basins of the same depth. In November 1942, the controlling depths were: to the lower turning basin 27½ feet, in the lower turning basin 27½ feet, connection between turning basins 30 feet, in the upper turning basin 27 feet. †In_____ 19____, the controlling depths in the channel were: _____

_____

_____

Anchorage.—No defined areas have been especially designated as anchorage ground. Anchorage may be obtained near the channel if the fairway is not obstructed.

For **quarantine, customs,** and **immigration,** see Portland.

Dockage and **wharfage** are assessed.

No **regulations** have been prescribed by official authorities of the city of Vancouver, or of the State of Washington, to govern the movement of vessels or similar harbor activities within the port.

The Municipal Corporation known as the **"Port of Vancouver"** has a municipal terminal just below the Interstate Highway Bridge.

Supplies.—Fresh water and supplies are available. There are no fueling facilities for large vessels, but gasoline and diesel oil may be obtained.

Repairs.—There are no facilities for making repairs to vessels.

Port Series No. 32 covers the port of Vancouver.

VANCOUVER TO BONNEVILLE

(CHART 6156)

Between Vancouver and Bonneville, the river is being improved by dredging where necessary to provide a channel 27 feet deep at low water; it is well marked. There are 38 dike dolphins along this section of the river; some of them are marked with lights at the ends. No bridges cross this section of the river. In 1941, the controlling depth between Vancouver and Bonneville was about 15 feet at low water. During the average summer freshet, the controlling depths are increased to a range of 33 to 38 feet.

Local Magnetic Attraction.—Differences from the normal variation of as much as 5° have been observed along this section of the Columbia River.

Camas, on the northern bank, 12 miles eastward of Vancouver, has a large paper mill and maintains a private wharf. The paper is shipped to Portland by barge for reshipment.

Washougal is on the northern bank just eastward of Camas. The Port of Camas-Washougal has constructed a wharf 528 feet in length at Washougal, which will be available for ocean vessels when an adequate channel is provided.

Difficulties attending navigation.—The principal difficulties and hazards to ship navigation are due to strong currents, rocky banks, rocks, winds, and accumulation of ice.

Wind.—Above **Corbett,** 18 statute miles above Vancouver, the river emerges from

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

the **Columbia River Gorge.** Above this point the river, for the greater part of the distance to The Dalles, flows between high, bold mountains of the **Cascade Range.** In this stretch, winds of material force prevail during much of the time, generally upstream in summer months and downstream in winter. The daily peak velocities vary from 7 to 48 miles per hour.

Currents.—Between **Dodson** and **Warrendale,** about 34.3 statute miles above Vancouver, the river becomes restricted and continues so to the entrance of the channel leading to the locks, at the lower end of **Bradford Island,** about 38.5 statute miles above Vancouver. Strong currents prevail along this stretch, the upper part of which is called **Garrison Rapids.** Difficulties are presented in turning out of the swift water into the channel leading to the lock, as the current from the spillway sets in strongly across the river. Considerable care must be taken in making the approach to the lock at Bonneville.

Ice.—Records of the now drowned out Cascade Locks show stoppage of, or interference with navigation for an average of two weeks per year, with the river closed by ice conditions for a period of 50 days in 1885, and 40 days in 1930. It is anticipated that the effect of the Bonneville Dam will further extend the period of closed navigation. The lock and approach channels at Bonneville are avilable as an ice harbor whenever danger from ice is imminent.

Bonneville, on the southern bank of the river, 82.9 statute miles above Vancouver, is the headquarters of the United States Engineers in charge of operating and maintenance of the Bonneville Dam and ship lock.

Bonneville Dam is in two parts. The spillway is between the northern bank and Bradford Island. The powerhouse and lock is between Bradford Island and the southern bank. The useable dimensions of the lock are 500 feet long by 76 feet wide, and 24.2 feet over the sills at Adopted Low Water. The lift at extreme low water and normal pool level is 66 feet. The normal pool level is 72 feet above mean sea level. Rules and regulations pertaining to the lock may be obtained from the United States Engineers at Bonneville or Portland.

BONNEVILLE TO THE DALLES

(CHART 6157)

The channel from Bonneville to The Dalles is provided by the pool which extends 49 statute miles to **Big Eddy.** This provides a channel with a project depth of 30 feet to The Dalles.

Two highway bridges across the river between Bonneville and The Dalles. The **Bridge of the Gods,** 3 statute miles above Bonneville, is a fixed span with a vertical clearance of 135 feet at normal pool level. The highway bridge at **Hood River,** 24.5 statute miles above Bonneville, has a vertical clearance at 67.8 feet at normal pool level. A vertical lift span is being installed in this bridge to provide a vertical clearance of 135 feet at normal pool level.

The **Cascade Locks,** located just above the Bridge of the Gods, have been drowned out. There are 6 overhead cables crossing the river between Bonneville and The Dalles. The minimum clearance is 131 feet at The Dalles. Two ferries cross the river; one between **Rowena,** Oregon, and **Lyle,** Washington, 8 statute miles below The Dalles; the second, between The Dalles and **Dallesport.**

The Dalles, on the southern bank of the river 82.9 statute miles above Vancouver, has a wharf 125 feet by 1,100 feet for the use of ocean vessels and river boats. On the

wharf are 2 one-story warehouses, each 92 feet by 461 feet; the warehouses are equipped with marine elevators. The port also has an oil wharf 27 feet by 193 feet. There are also privately owned facilities for handling petroleum products and bulk grain from river boats. River traffic between Vancouver and The Dalles consists mainly of petroleum products and general freight bound upstream, and wheat, wool, and rafted logs bound downstream.

COLUMBIA RIVER ABOVE THE DALLES AND SNAKE RIVER

(NO CHARTS)

Above The Dalles, there is some navigation by river boats, tugs, and oil barges. Traffic is mostly wheat and petroleum products. High power light-draft steamers navigate the Columbia to **Priest Rapids,** about 340 statute miles above its mouth. A project provides for a channel 7 feet deep from **Celilo Falls** to **Wallula,** with no specified depths between Wallula and the mouth of **Snake River;** on the Snake River between its mouth near **Pasco,** Washington, a depth of 5 feet to **Lewiston,** Idaho. In June 1941, the controlling depths were as follows: 5-foot channel to the foot of Umatilla Rapids; 6 feet through the Umatilla Rapids and Wallula; 4 feet through the Homly Rapids between Wallula and the mouth of the Snake River. †In _____ 19____, the controlling depths in the channels were:_____

_____

_____

A survey in 1934–35 showed the controlling depths on the Snake River to be less than 1 foot between the mouth and Lewiston and about 2.7 feet between Lewiston and Johnsons Bar. From the mouth to Riparia, on account of crooked and shoal channels through the rapids, commercial navigation has been limited to stages above 3 feet on the Lewiston gage, which permits a draft of about 4 feet to Lewiston. The river is above the 3-foot stage about 54 per cent of the time. High-powered launches operate above Lewiston as far as Johnsons Bar.

The Dalles-Celilo Canal, 8.6 statute miles long, has its lower end 3.3 statute miles above The Dalles. There are 5 locks in the canal with a depth of 7 feet over the lower sill; the useable dimensions of the locks are 265 feet long and 45 feet wide. This canal is drowned out when the stage at the upper pool exceeds 18 feet. There is a turning basin, 220 feet wide, in the canal near its lower end. There are two warehouses on the canal with a combined capacity of 15,000 tons of wheat.

Four ferries cross the Columbia River above The Dalles as follows: Biggs-Merryhill, 16 statute miles; Arlington-Roosevelt, 50 statute miles; Boulder-Alderdale, 65 statute miles; and Irrigon-Coolidge, 88 statute miles.

There are no wharves on the Columbia River above **Celilo.** Facilities for handling bulk grain from trucks to river craft are as follows: One 15,000 bushel elevator at **Belalock;** one 40,000 bushel elevator at **Umatilla;** and 2 private warehouses with a combined capacity of 84,000 bushels at **Port Kelly.** These are located 32, 88, and 110.6 statute miles, respectively, above Celilo. At **Attalia,** 117 statute miles above Celilo, and at Umatilla, there are private storage tanks for handling petroleum products from river boats.

† Date and values to be inserted by the navigator from data in latest Supplement or Notice to Mariners.

Chapter 14.—COLUMBIA RIVER TO DESTRUCTION ISLAND

(CHART 6002)

LONG BEACH TO CAPE SHOALWATER AND WILLAPA BAY

(CHART 6185)

From Cape Disappointment, the coast extends northward for 22 miles to Willapa Bay, as a low, sandy beach, with sandy ridges about 20 feet high parallel with the shore. Back of the beach, the country is heavily wooded. Numerous summer resorts and cottages are situated along the beach.

The former Klipsan Beach Coast Guard station is situated on the beach about 10 miles northward of North Head. The buildings are being used by the personnel of the direction finder station. The **Klipsan Beach direction finder station** is located at the former Coast Guard station.

Leadbetter Point, the southern point at the entrance to Willapa Bay, is low and sandy, with no distinctive feature to mark its extremity nearer than the limit of the trees, 2.8 miles southward.

Cape Shoalwater, the northern point at the entrance, terminates in a low bluff about 50 feet high. It is sandy, and the northern portion is covered with trees to within 300 yards of the point.

Willapa Bay Light* is shown from a black skeleton tower situated near the southern extremity of the point, clear of the trees, on a sand ridge about 50 feet high. The light is 138 feet above the water, and visible 18 miles. There is a radiobeacon equipped for distance finding. A temporary Coast Guard lookout tower is situated about 300 yards southward of the light.

Willapa Bay, formerly known as **"Shoalwater Bay",** has its entrance 22 miles northward of Cape Disappointment. The bay, with its various tributaries, furnishes an outlet to an extensive area of valuable timber. Lumber and lumber products are the principal exports; fish and sea foods are also shipped. The imports consist of general merchandise, mill machinery, and farming implements. The port of entry is at South Bend, on the Willapa River.

Willapa Bay entrance.—The northern shore of the entrance to this bay is distinctive in appearance with respect to the southern shore, being marked by timbered bluffs and ridges, several hundred feet high. In the daytime, scars on the cliffs can often be seen before the light is visible. The termination of the tree line on Leadbetter Point is sharply defined.

The entrance is in the northern part of the bay, which consists of two arms; the southern, 16 miles, and the eastern, 10 miles long. Both arms are filled with extensive shoals, large areas of which bare at low water. The southern arm is separated from the ocean by a strip of low sand and sand dunes, averaging 1.5 miles in width and covered with trees until within 2.8 miles of Leadbetter Point, the southern point of the entrance to the bay. Numerous cottages and summer resorts are situated along the seaward

*Lat. 46°43.2, Long. 124°03: Charts 6185, 6002, 5052, 9000.

face of the narrow peninsula. The shores of the bay elsewhere are composed of low, rolling hills, 100 to 200 feet high, covered with a dense growth of timber.

The **bar** at the entrance lies about 3 miles outside of the line joining the light and Leadbetter Point. It has been improved by dredging; however, the channel over it is continually shifting. Experience shows, that this channel works to the southward until it is parallel with the shore, then breaks out to the westward, the cycle consuming 20 to 30 years.

The depth over the bar varies from season to season. It has been dredged annually since 1930 and during that time depths between 25 feet and 32 feet have been maintained. In September 1942, the controlling depth over the bar was 22 feet. †In _____ 19___, the controlling depth on the bar was: _____. The bar buoys and those inside the bar have been moved from time to time because of the shifting sands and changing channel. The temporary entrance range lights are sometimes established for dredging purposes and these do not necessarily mark the best water. Due to the changeable character of this entrance, vessels should always employ a pilot.

Prominent features.—Willapa Bay Light on Cape Shoalwater, the northern point at the entrance, is the most prominent feature in the approaches.

A **Coast Guard station** is located at North Cove, a mile eastward of Willapa Bay Light. There is a telephone line to South Bend, and vessels off the bar are reported.

Willapa Bar whistle buoy is moored about 6 miles southwestward of the light. This buoy is moved occasionally to follow changes in the channel over the bar. The channel across the bar is marked by buoys. Ranges, buoys, beacons, and lights, mark the channel through the eastern arm of the bay and the Willapa River, to South Bend and Raymond.

Willapa River enters at the head of the eastern arm and has been improved by dredging. The channel was dredged to a project depth of 24 feet in the north fork to the Riverdale Bridge, and in the south fork, to the site of the old Cram (Hanify) Lumber Mill. At high tide vessels drawing 12 feet can ascend to **Willapa,** 11 miles above the mouth.

In October 1940, the controlling depths in the dredged channel were as follows: below forks at Raymond, 23 feet; lower 2,700 feet of North Fork, 23 feet; lower 1,500 feet of South Fork, 18 feet. †In _____ 19___, the controlling depths in the channel were: _____
_____.

Cedar River winds across the flats from Toke Point for 2 miles to the head of the flats. The channel is marked by a series of privately maintained beacons. Small towboats can ascend the river at half tide to a log raft 0.25 mile northward of the mouth of the river.

North River enters the eastern arm of the bay 3 miles westward of the mouth of Willapa River; it is navigated by small logging launches. The river has been improved by the removal of snags and log jams. The channel is marked by privately maintained beacons, and is navigable at high tide, to **Eaton's ranch,** a distance of about 3 miles above the last beacon.

South Bend is situated on the southern bank of Willapa River, 3 miles above the mouth. The town is mainly dependent on the lumber, oyster, and fish industries. It

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

has a large sawmill and shingle mills, and two canneries. The depths at the wharves vary from 15 to 20 feet, depending on the locality.

Raymond, the principal town, is on the southern bank of the Willapa River, at the junction of the south fork, 3 miles above South Bend. It has sawmills and shingle mills, and under normal conditions ships large quantities of lumber. The depths at the wharves range from 20 to 25 feet. There is a new State highway leading on a direct route to Aberdeen on Grays Harbor.

Pilots.—Pilots may be obtained from South Bend. Vessels desiring a pilot should call the Grays Harbor-Willapa Harbor Pilots Association, Aberdeen, or Captain Marcus Neilson at Raymond, through Olympic Radio Co., and state time of arrival off the bar. The pilot boat is equipped with radio. In 1941, the pilot charges were $1.50 per foot draft and 1½ cents per net ton each way, in or out. The minimum charge is $115.00 for one round trip. Deep-draft vessels should not attempt to enter without a pilot.

Towboats.—Sailing vessels desiring a towboat should make Grays Harbor, signal the Coast Guard station there, and await the towboat. Small power boats are available.

Quarantine.—Quarantine regulations are enforced by an officer stationed at South Bend. Vessels subject to quarantine must not pass beyond the first dock at South Bend until pratique has been granted. There are arrangements for fumigation by sulphur only.

Customs.—The customs office is located at the Port of Willapa Terminal. South Bend is a subport in the Washington customs district.

Marine hospital.—There is a medical relief station in charge of a public health officer at South Bend.

Anchorage may be had at almost any point inside the bay; the holding ground is good.

The Twelfth Street Turning Basin at Raymond is 250 feet wide, 350 feet long, 24 feet deep. The Main Turning Basin, at the junction of the North and South Forks, is used by ships up to 450 feet long and 24-foot draft. Ships turning usually head up the South Fork, back with aid of a small tug into the North Fork, then straighten out down the main river.

Tides.—The mean range of tide at South Bend is 7.8 feet. The range between mean lower low water and mean higher high water is 9.8 feet. A range of about 14 feet may occur at the time of maximum tides.

Currents.—In the entrance the average velocity of the flood or ebb stream is about 2½ knots at strength. Currents of 4 to 6 knots occur at times, the velocity being greatest on the ebb, particularly with a southerly wind.

In the channel opposite South Bend, Willapa River, the current turns about ¼ hour after the times of the tide at Astoria. The average velocity of the flood stream at strength is about 1 knot and that of the ebb stream about 1½ knots. On the bar, the current changes at about the time of high and low waters.

Bridges.—The North and South Forks of the Willapa River are crossed by three draw bridges at Raymond. A fixed highway bridge at Willapa, with a vertical clearance of 11 feet at high water, limits the navigation beyond this point. The Riverdale Highway bridge over the North Fork has a horizontal clearance of 125 feet and a vertical clearance of 14.5 feet at MHW, when closed. The Northern Pacific Railroad bridge over the South Fork has a horizontal clearance of 126 feet and a vertical clearance of 7 feet at MHW, when closed. The highway bridge over the South Fork has a horizontal clearance of 125 feet and a vertical clearance of 10 feet at MHW, when closed. The signal for all three bridges is three long blasts.

DIRECTIONS, WILLAPA BAY

From northward or southward, the course should be shaped to make the lighted whistle buoy. From seaward, in clear weather, the lights at the entrance, at Grays Harbor, 14 miles northward, and at North Head, 22 miles southward, are distinguishing marks for fixing a vessel's position and the subsequent shaping of the course.

Approaching from any direction in thick weather, great caution is essential. The currents are variable and uncertain. Velocities of 3 to 3½ knots have been observed at the lightships between Blunts Reef and the Swiftsure Bank, and velocities considerably in excess of these amounts have been reported. Under such conditions vessels should not shoal the water to less than 20 fathoms until the lighted whistle buoy off the entrance has been made. For detailed information regarding the conditions which may be encountered, and the precautions to be observed, see the statement on coastwise navigation beginning on page 37.

Strangers should not attempt to navigate the bay in thick weather. At any time, however, when the aids to navigation can be seen, vessels of 20 feet or less draft should have little difficulty in reaching the wharves at Raymond or South Bend, as the channel throughout is well marked by ranges, beacons, and buoys. Vessels of a deeper draft should secure the services of a pilot.

Port Terminal.—The port of Willapa Harbor maintains a terminal, with a 600-foot wharf, on the southern bank of the river between South Bend and Raymond; the depth along the face of the wharf is 24 feet. The offices of the Port Manager are on the wharf.

Supplies.—Provisions and water may be obtained at South Bend, Raymond, and the Port of Willapa Bay Terminal. Fuel oil may be had at South Bend or Raymond, and coal may be obtained by prior arrangement.

Repairs.—Repairs to wooden vessels may be made, but there are no drydocks. There are machine shops and foundries.

Communication may be had by rail and bus; there is regular bus service to the north, south, and east; telegraph and telephone facilities are available.

Tokeland, on **Toke Point,** about 2 miles eastward of Cape Shoalwater, is a summer resort. There is a wharf, with about 6½ feet alongside, mostly used by crab and oyster men, at Toke Point which is maintained by the Port of Willapa Bay. A daily bus runs to Aberdeen.

The channel leading to Nahcotta has sufficient depth for any vessel that can cross the bar and is well marked by lights and buoys. This section of the bay is used by local light-draft craft only.

The channel to Bay Center is marked by lights and buoys. The Bay City Channel and Goose Point Ranges were established in 1939. These ranges should only be used with local knowledge as the channel is subject to change in its location and the ranges do not always mark the best water. The Bay Center Channel Range front mark is a light shown from a black house with a white diamond daymark with red vertical stripe on pile dolphin; the rear mark is a white diamond daymark with red vertical stripe on white skeleton tower located on the shore. The range bears 63°. There is a privately maintained lighted range for the channel to Bay Center from the Palix River.

Bay Center is a small village on **Goose Point** on the eastern shore of the southern arm near its entrance; oyster culture is the main industry, but fish and crabs are also important products. The old wharf northeastward of the village has rotted away. A small mooring basin, the entrance of which is practically dry at low tide, is maintained in the slough, just southward of the village.

Bone River enters the bay about 2 miles northeastward of Goose Point. The entrance channel across the flats is tortuous and shoal; passage at high tide only is possible for very small boats. A fixed highway bridge, crossing the river at its mouth, has a horizontal clearance of 30 feet and a vertical clearance of 15 feet at MHW.

Niawiakum River enters the bay about a mile eastward of Goose Point. It is shoal and cannot be navigated except at high tide. A fixed highway bridge, crossing the river about 0.5 mile above the mouth, has a horizontal clearance of 60 feet and a vertical clearance of 14 feet at MHW.

Palix River is the second largest river on the eastern side of the bay. It is navigable for small logging towboats and fishboats for about a mile up each of the three forks above their junction. A fixed highway bridge, crossing the river about a mile below the forks, has a horizontal clearance of 65 feet and a vertical clearance of 15 feet at MHW.

The channel to **North Nemah River** is marked by privately maintained beacons for a distance of 3 miles across the flats. In 1939, the controlling depth was 5 feet in this section of the channel. The channel divides at the last beacon; the eastern channel leads to North Nemah River and is practically dry at low water; the western channel leads to **South Nemah River,** and had a controlling depth in 1939 of 3 feet. Logs and oysters are shipped from these rivers.

Nahcotta is a small village about 9 miles southward of Leadbetter Point. Oyster culture and processing are the principal industries; there are three large oyster packing plants and a shell processing plant. A large wharf, maintained by private interests, has a face approximately 70 feet long with depths of 28 feet.

Stanley Channel leads from **Nahcotta Channel** at Long Island Shoal Light, black house on pile dolphin, eastward of Long Island and **Stanley Peninsula** to Long Island Slough and to the mouth of the Naselle River. Shoal-draft boats with local knowledge can cross **Long Island Shoal.**

Long Island, 5.5 miles long in a northwesterly direction and of irregular width, wooded and rising to over 200 feet in elevation, lies in the southern arm of the bay near the head, and nearly fills it.

Naselle River is the largest of the rivers entering on the eastern side of the bay. It is navigable by boats of 5 feet or less draft to the bridge at the village of **Naselle.** This bridge marks the head of tide water, at ordinary high tides. A highway drawbridge, crossing the river about 2.2 miles above the mouth, has a horizontal clearance of 115 feet and a vertical clearance of 10 feet at MHW, when closed; the whistle signal is 4 long blasts. Between the bridges, the river has numerous snags and submerged logs, and passage should not be attempted without local knowledge. Small logging and fishing boats operate on the river.

Bear River enters at the southeastern corner, at the head of the bay. A long tortuous, unmarked channel across the flats, makes entrance to the river difficult. Vessels of 5-foot draft or less can make the fixed bridge about 1.5 miles above the mouth at half-tide. The bridge has a horizontal clearance of 25 feet and a vertical clearance of 15 feet at MHW.

CAPE SHOALWATER TO POINT CHEHALIS

(CHART 6002)

From Cape Shoalwater to Point Chehalis, the southern point at the entrance to Grays Harbor, the coast extends for 12 miles as a low sand beach, backed by a heavy growth of timber.

GRAYS HARBOR

(CHART 6195)

Point Chehalis is low and sandy and for 1.5 miles southward of the extremity, is bare of trees. A jetty projects seaward from the end of the point.

Grays Harbor Light* is shown from a white octagonal pyramidal tower, 107 feet high, situated on the seaward side of Point Chehalis. The light is 123 feet above water and visible 17 miles. A fog signal is sounded on an air diaphone. There is a radiobeacon equipped for a distance finding located here.

Grays Harbor Coast Guard station is at Westhaven. The lookout tower is at the shore end of the south jetty. The former station is just southward of the light; the buildings are still standing, but are not used.

Point Brown, the northern point at the entrance to Grays Harbor, is 2.5 miles northward of Point Chehalis; it is low, rounding, and sandy, with shoals extending southward and westward, forming with those extending westward from Point Chehalis the bar at the entrance. The point is wooded to within 0.5 mile of the extremity, near which is a lone tree. A jetty extends southwestward from the point.

Grays Harbor has its entrance about 40 miles northward of Cape Disappointment and 93 miles southward of Cape Flattery. The bay and its tributaries furnish an outlet to an extensive area of valuable timber. Grays Harbor is probably the leading lumber port in the United States, and its shipments include both coastwise and foreign. The port of entry is at Aberdeen.

The bay at the entrance is about 2 miles in width, but shoals extending southward from Point Brown, contract the navigable channel to a width of 0.4 mile. From the entrance the bay extends eastward for 15 miles to the mouth of the Chehalis River. The bay throughout is filled by shoals and flats, mostly bare at low water, and cut by numerous channels.

Westport is a village on Point Chehalis in South Bay, just inside the entrance to Grays Harbor; it is a summer resort principally, but it is also the headquarters for several hundred fish boats. The old wharf is in ruins, but a new wharf known as the "Port of Grays Harbor wharf" has been built at **Westhaven**, about 1 mile northward of Westport; there is 13 feet alongside. The fish pack is all shipped out by truck.

Bay City, on the eastern shore of South Bay, was formerly the site of a whaling station and fertilizer factory, but these have now been abandoned. The old wharf, built out to 10 feet, is still standing and in good condition, and is used by a few fish boats.

Ocosta, on the eastern shore of South Bay, 2 miles northward of Bay City, is a small settlement of no commercial importance.

Markham, on the southern shore of the bay, 2 miles northeastward of Ocosta, has a shingle mill, whose product is shipped by rail. Logs are towed to the mill by way of the channel southward of **Whitcomb Flats.** It is the terminus of a railway which follows the southern shore of the bay from South Aberdeen.

Hoquiam is situated on the northern shore at the mouth of Hoquiam River, 12.5 miles from the entrance to the harbor. There are large lumber and shingle mills here, and wharves with from 10 to 30 feet alongside, according to locality.

Aberdeen is the largest city on the bay. It adjoins Hoquiam on the east and includes **South Aberdeen** on the southern side of the Chehalis River. The **Wishkah**

*Lat. 46°53′.3, Long. 124°07′.0: Charts 6195, 6002, 5052, 9000.

River, crossed by four bridges within the city limits, flows through the eastern end of the city. The depth alongside the wharves varies from 10 to 30 feet, according to locality.

Aberdeen and Hoquiam are both served by the Northern Pacific, Union Pacific, and Chicago, Milwaukee and St. Paul Railroads.

Cosmopolis is a small town located on the southern side of the Chehalis River, a short distance above South Aberdeen.

Montesano is situated on the northern bank, about 14 miles above Aberdeen. Several sawmills are located here; lumber is generally carried on barges to Aberdeen for loading, although coastwise vessels drawing up to 18 feet can reach Montesano at high tide, and do handle a considerable portion of the trade.

Prominent features.—The country about Grays Harbor is flat and featureless, with few conspicuous objects. **Saddle Hill,** about 310 feet high, 8 miles northward of the entrance and 2 miles inshore, is the most conspicuous feature.

Grays Harbor Light shows prominently on a closer approach to the entrance. In clear weather, **Brackenridge Bluff,** on the northern shore of the bay, 6 miles inside the entrance, is quite prominent. It is a reddish cliff about a mile long, rising in two places to a height of 80 feet; from seaward it is visible only through the entrance.

In clear weather, **Neds Rock** shows prominently from inside the entrance; it is reddish in color.

The entrance is marked by lighted ranges and by buoys which are shifted to mark the best water as determined by frequent surveys of the bar. Due to the changeable conditions here, vessels should not attempt the entrance without a pilot or local knowledge.

The south jetty has been built up so that there is no submerged portion. The reconstruction of the north jetty is underway (1941) and upon completion will be visible for its entire length.

The entrance to Grays Harbor is between two jetties built out from Point Chehalis and Point Brown. The channels have the following project depths: 30 feet in the entrance between the jetties; thence 26 feet to the railroad bridge at Aberdeen, a distance of 16 miles; thence 18 feet to Cosmopolis; thence 16 feet to Montesano.

In August 1942, the controlling depth in the entrance was 26 feet. In June 1942, the controlling depths were: inner harbor and river channel below Aberdeen, 26 feet to Union Pacific bridge; Aberdeen to Cosmopolis, 21 feet. In June 1934, the controlling depth to Montesano was 10 feet. The controlling depth in the entrance is given at very frequent intervals in the "*Notice to Mariners.*"

†In _____ 19____, the controlling depth on the bar was _____ feet. In _____ 19____, the controlling depths in the channel were: _____

Experience has been that the bar shoals considerably during the winter months. However, it is dredged sufficiently deep every summer so that it seldom shoals to less than 25 feet. Deep-draft vessels must wait for favorable bar conditions before passing out, and are subject to delay on this account.

North Bay, on the northern shore immediately eastward of Point Brown, is a shallow bight, about 4 miles long at the entrance and 4 miles wide. It is filled with shoals and flats, bare at low water. The **Humptulips River** enters in the northern part of the bight, and several narrow channels wind through the flats to the main channel

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

of the bay. There is some oyster culture in the bay and it is considerably used by small oyster boats.

South Bay, on the southern shore, immediately eastward of Point Chehalis, is about 2 miles long and 2 miles wide. It is full of shoals, bare at low water, with a narrow channel leading through them to the mouth of the **Elk River,** which empties at the head of the bay. Cedar logs are towed out of Elk River. There is a single leaf bascule bridge over the Elk River at Bay City.

South Channel is a buoyed channel with a controlling depth of 12 feet and follows the southern shore. This channel is used quite often by small tugs with log rafts. There is a log dump about 3 miles eastward of South Arbor, at which timber is dumped from trucks hauling it from the surrounding logging camps.

Chehalis River enters at the eastern end of Grays Harbor. It is navigable by light-draft steamers to **Elma,** 30 miles above the mouth, and the upper portion of the river, for a distance of approximately 45 miles above Elma, is used for floating saw logs.

Hoquiam River empties into Grays Harbor about 2 miles westward of the mouth of the Chehalis. The river is practically a tidal slough, 11 miles long. It has been improved for a distance of 2 miles above the entrance by dredging a channel 100 feet wide and 18 feet deep. Four bridges cross the river in Hoquiam.

Pilots.—Pilots may be obtained by calling the Grays Harbor-Willapa Harbor Pilots Association, Aberdeen, through Olympic Radio Co., and stating time of arrival off the bar. Pilots also may be obtained off the entrance by signals which are relayed by the Coast Guard lookout station on Point Chehalis. The pilot boat is equipped with radio.

Pilot charges are $1.50 per foot of draft and 1½ cents per net ton each way, in or out. Minimum pilotage charge, in or out, is $115.00. The inward charge is to the first berth of the ship; shifting charge is $15.00, plus tug hire if required. Vessels must have full steam for shifting, and it is the general custom to shift berth at a time when the current will be against the progress of the ship. Vessels proceeding to Grays Harbor from the Columbia River, Willapa Bay, or Puget Sound ports can usually make arrangements with the pilot associations to send a pilot to the port of departure, thereby avoiding delay at the entrance due to fog or stormy weather. Information relative to conditions on the bar can be obtained by radio from the pilot association.

Towboats are available for use over the bar and inside the harbor. Vessels desiring a towboat should signal the lookout station at Point Chehalis. It is advisable to notify the stevedoring companies as far in advance as possible as to the time of arrival off the bar and the nature of the cargo to be handled.

Quarantine.—Regulations of the Public Health Service are enforced. Vessels subject to quarantine inspection are boarded abreast of Hoquiam or at their first loading berth. There is a charge of $10.00 for this service to foreign ships. Fumigation, when necessary, is done by one of the stevedoring companies under supervision of the Public Health Service. Only sulphur fumigation is available, and the charge is $75.00. Vessels may be shifted to a designated anchorage if necessary.

Customs.—Aberdeen is a subport in the Washington customs district and is in charge of a deputy collector of customs. The customhouse is situated at the corner of Second and G Streets.

Immigration.—The Immigration Service maintains an office at the Federal Building, Second and G Streets, Aberdeen, Washington.

Marine hospital.—A relief station of the Public Health Service, in charge of an Acting Assistant Surgeon, is located at 720 Becker Building, Aberdeen.

Anchorage may be had anywhere in the channels inside the bay. The best anchorage is southward of **Sand Island,** in depths of 35 of 40 feet. Here the holding ground is good, and there is more swinging room than elsewhere in the harbor. There is not much swinging room northward of the main channel; the shoal is gradually encroaching in the channel to the eastward of Sand Island. Outward-bound vessels, waiting opportunity to cross the bar, frequently anchor in the channel abreast Westport.

Tides.—The mean range of tide at Aberdeen is 7.8 feet. The range between mean lower low water and mean higher high water is 9.9 feet. A range of about 14 feet may occur at the time of maximum tides. Daily tide predictions for Aberdeen are given in the *Tide Tables*, published annually in advance by the United States Coast and Geodetic Survey.

Currents.—In the entrance, the average surface velocity of the flood or ebb streams at strength is about 2½ knots, but velocities up to 5 knots may occur. In the channels through the bay, the velocities seldom exceed 3 knots. Under normal conditions, the current at the bar changes at about the time of high and low water. The master of the dredge working on the bar states that the currents are very erratic. He usually experienced a northerly set close inshore, and a southerly set offshore.

Drawbridges.—The navigable tributaries to Grays Harbor are crossed by anumber of drawbridges. The following table gives their location, clear width of opening, and the whistle signal prescribed for use by a vessel desiring their opening:

Bridge	Width of opening	Clearance closed	Whistle signals
South Bay			
	Feet	*Feet*	
Bay City, highway, bascule	100	5. 7	— — —
Johns River			
N.P.R.R. (abandoned) swing	54	10	— — —
Markham, highway, fixed	76	31	
Hoquiam River			
At mouth, N.P.R.R., swing	125	8	— — —
Simpson Avenue, highway, bascule	125	36	— — .
Eighth Street, highway, swing	124	8. 8	— — . .
Near forks, N.P.R.R., swing	105	3	— . —
Wishkah River			
River Street, N.P.R.R., swing	125	8	— .
Heron Street, highway, swing	125	7	— . .
Wishkah Street, highway, bascule	125	4. 6	— . . .
Second Street, highway, swing	100	6	— . . . .
Chehalis River			
Aberdeen, O.W.R. and N., swing	125	8	— — —
Wests Bridge, highway, swing	130	8. 5	— — .
Aberdeen, N.P.R.R., swing	125	9	— . —
Montesano, R.R., swing	125	8	— — —
Montesano, highway, swing	125	8	— — —

The following are the **regulations** governing the operation of the above bridges:

1. The corporations or persons owning or controlling a drawbridge shall provide the same with the necessary tenders and the proper mechanical devices for the safe, prompt, and efficient opening of the draw for the passage of vessels.

2. *If the weather conditions are good and sound signals can be heard* when a vessel approaches a drawbridge and desires to pass through the draw, (*a*) the person in charge of such vessel desiring to pass shall cause to be sounded, within reasonable hearing distance of the bridge, repeating if necessary, and in time to give due notice to its operator, *three long distinct blasts*[1] of a whistle, horn, or megaphone, or three loud and distinct strokes of a bell.

(*b*) *When the draw of the bridge can be opened immediately,* the draw tender shall reply by *two long* blasts followed by *one short* distinct blast of a whistle, horn, or megaphone, or by three loud and distinct strokes of a bell.

(*c*) *When the draw of the bridge cannot be opened immediately,* the draw tender shall reply by *two long distinct blasts* of a whistle, horn, or megaphone or two distinct strokes of a bell. (This signal may also be used by a vessel to countermand its signal to open the draw.)

(*d*) *When, after a delay,* as in 2 (*c*) the draw of the bridge can be opened and the vessel still desires to pass, the draw tender shall give the signal described in 2 (*b*) above, viz: *Two long* blasts followed by *one short* distinct blast of a whistle, horn, or megaphone, or three loud distinct strokes of a bell.

3. *When weather conditions prevent hearing sound signals,* (*a*) the person in charge of a vessel desiring to pass shall *swing a white lighted lantern or white flag,* the former by night, the latter by day; the person signalling to face the drawbridge and swing the lantern or flag in front of him at arm's length, in vertical circles.

(*b*) *When the draw of the bridge can be opened immediately,* the draw tender shall reply by *raising and lowering a white lighted lantern or a white flag,* the former by night and the latter by day; the movement to be vertical.

(*c*) *When the draw of the bridge cannot be opened immediately,* the draw tender shall reply by *swinging a red lighted lantern or red flag,* the former by night, the latter by day: the person signaling to face the vessel and swing the lantern or flag in front of him at arm's length, in vertical circles. (This signal may also be used by a *vessel to countermand its signal to open draw.*)

(*d*) When, *after a delay,* as in 3 (*c*) the draw of the bridge can be opened and the vessel still desires to pass, the draw tender shall give the signal described in 3 (*b*) above, viz: *raising or lowering a lighted lantern or flag.*

4. *When fog prevails* by day or by night the draw tender on giving signal (2 (*b*), 2 (*d*), 3 (*b*) or 3 (*d*) above) that draw will be opened, shall *toll a bell continuously* during the approach and passage of the vessel.

5. The draw shall be opened with the least possible delay, upon receiving the prescribed signal: *Provided,* That the drawspan shall not be opened when a train is approaching so closely that it cannot safely be stopped before reaching the bridge, or when a passenger or mail train is approaching within sight or hearing of the operator of the drawspan.

6. Trains, wagons, and other vehicles shall not be stopped on a drawbridge for the purpose of delaying its opening, nor shall water craft or vessels be so manipulated as to hinder or delay the operation of a drawspan, but all passage over, through, or under a drawbridge shall be prompt, to prevent delay to either land or water traffic.

7. The foregoing general regulations (pars. 1–6) shall apply in the cases of all bridges, but to provide for distinctive signals given by vessels to particular bridges, as where two or more are within sight or hearing and but one bridge is desired to be opened, special regulations and exceptions are prescribed. (See preceding table of bridges for special whistle signals.)

DIRECTIONS, GRAYS HARBOR

From northward or southward, the course should be shaped to make the entrance buoy. From seaward, in clear weather, Saddle Hill, 8 miles northward of the entrance, and the light on Point Chehalis, will be seen. See description of Saddle Hill, page 238.

Approaching from any direction in thick weather, great caution is essential. The currents are variable and uncertain. Velocities of 3 to 3½ knots have been observed at the lightships between Blunts Reef and Swiftsure Bank, and velocities considerably in excess of these amounts have been reported. Under such conditions vessels should not shoal the depths to less than 20 fathoms unless sure of the position. For detailed

[1] As used in these general regulations and in the special regulations, the term *long* blast of a whistle or horn shall mean a blast of four seconds duration, and a *short* blast shall mean one of one second duration.

information regarding the conditions which may be encountered and the precautions to be observed, see the statement on coastwise navigation, beginning on page 37.

Strangers are advised to take a pilot, and they should in no case attempt to cross the bar when it is breaking.

At any time when the aids to navigation can be seen, vessels of 20 feet or less draft, having crossed the bar, should have no difficulty in reaching the wharves at Hoquiam or Aberdeen. The channels should not be attempted in thick weather. Due to the changeable character of the channels and the necessary shifting of the aids to navigation, no directions of a permanent value can be given.

The **Port of Grays Harbor Commission** directs the affairs of the port district, which is coextensive with Chehalis County, and of the port facilities under its control. All rates of wharfage, dockage, warehousing, and other port and terminal charges in connection with improvements owned and operated directly by the port district, are are fixed by the commission.

Dockage or **berthage** and **wharfage** are charged.

Port terminals.—Midway between Hoquiam and Aberdeen, the Port of Grays Harbor has constructed and operates a modern freight terminal with two slips, which are maintained by dredging to 30 feet. The terminal has rail connections and is equipped with modern improvements for handling lumber and other cargo. Fuel oil may be obtained from pipeline connections on the dock. Storage space for lumber and lumber products is available. The character of the water-borne commerce at this port has not rendered necessary the construction of terminal warehouses or grain elevators. There are general warehouses located some distance from the waterfront.

Supplies.—Fuel oils, water, provisions, and ship chandler's stores can be obtained. A limited amount of coal is kept on hand and any amount can be obtained on short notice, but the facilities for handling it are inadequate.

There is a **chart agency** of the U. S. Coast and Geodetic Survey situated here.

Lighterage.—Open barges are available. Generally the lighterage charge is paid by the shipper unless lighterage is for the ship's convenience.

Repairs.—There are marine railways capable of taking vessels under 130 feet in length; there are machine shops and foundries capable of making ordinary repairs.

Communication.—Grays Harbor is served by three lines of transcontinental railroads, and a large number of ships operating in foreign, intercoastal, and coastwise trade call at the various ports on the bay. There is a good highway to Olympia, and also a good State highway (U. S. 101) running to northern and southern points. Radio, telephone, and telegraph facilities are available.

Grays Harbor County Airport was under construction (1941) by fill, extending from the northern shore to **Moon Island,** thence along the northern side of North Channel to just westward of Hoquiam. This field will be connected by pier at the western end to Grays Harbor City and by causeway to the land near Hoquiam.

The former airport is located on property of the port commission just east of its terminal.

The **United States Coast Guard office** is located in the Federal Building at Hoquiam.

The office of the Port of Grays Harbor Commission is located at the foot of Myrtle Street, Aberdeen.

The office of the **Grays Harbor-Willapa Harbor Pilots Association** is located in the Douglas Weatherwax Building, Aberdeen.

Port Series No. 28 covers the port of Grays Harbor.

Storm warnings are displayed by the Weather Bureau at Aberdeen, and from a signal tower on Port of Grays Harbor Wharf.

GRAYS HARBOR TO DESTRUCTION ISLAND

(CHART 6002)

From Point Brown, the coast extends northward for about 22 miles to Point Grenville, as a low, sandy beach, broken occasionally by small streams and in some places by bluffs. A few small settlements, connected by roads or trails, are scattered along this stretch.

Copalis Head, 12 miles northward of Point Brown, is a bright yellow bluff, about 2 miles long and 140 to 200 feet high. It is situated 1.8 miles northward of **Copalis River.** **Copalis Rocks,** two small rocks, the larger 34 feet high, lie 500 yards off the head, and a rock, awash, lies about 0.5 mile west-southwestward of the head.

Two small bluffs mark the mouth of **Joe Creek,** about 3.5 miles northward of Copalis Head.

Moclips River enters about 6 miles northward of Copalis Head. The southern point at the mouth is bare and sandy; on the northern bank, is a bright yellowish bluff, 50 feet high. **Moclips,** a watering place near the mouth of this river, is connected by a branch of the Northern Pacific Railroad with Hoquiam on Grays Harbor. The red tanks and stacks are prominent from seaward; a shingle mill is located at Moclips. Some logs and considerable shingles are shipped by rail. A triangular-shaped, yellowish bluff, about 110 feet high, on the south bank of **Wreck Creek,** which empties about 2.5 miles northward of Moclips, is prominent from offshore.

Point Grenville* is a broken, rocky promontory with nearly vertical, whitish cliffs over 100 feet high. Numerous rocks extend for some distance off the point. **Grenville Arch,** dark in color, 83 feet high, is the outer and more prominent of two rocks lying westward of the point; it is over 0.5 mile 237° from the inner extremity of the point. A rock, awash at high water, lies 400 yards 316° from Grenville Arch. The western rock, off the western end of the point, is 200 yards off the cliff and 92 feet high. There are a number of rocks inside of it, but none outside. Two rocks over 90 feet high lie 400 yards southward of the southern extremity of the point.

An indifferent anchorage in northwesterly weather may be had under Point Grenville by vessels of moderate draft, but the depths compel anchoring at such a distance from the beach that little shelter is afforded. The anchorage is in 4 fathoms, sandy bottom, with the inner extremity of the cape bearing 338°, and Grenville Arch bearing 293°. This anchorage is not recommended for ordinary use.

Northward of Point Grenville, is a series of cliffs, the upper part appearing light gray, the lower part dark, separated by a well-defined line of demarcation. This formation disappears near the southern end of the cliffs, where they are much broken up, and present a stratified appearance, the strata having a downward slope to the northward. Northward of the cliffs, is a shingle beach, northward of which are irregular bluffs and cliffs terminating near Taholah in white cliffs of uniform height, which from offshore, do not present the stratified appearance noticeable to the southward.

Quinault River breaks through the cliffs about a mile southward of Cape Elizabeth.

Taholah is an Indian village on the banks of the Quinault River. The shoreline in this section is low. The Quinault is navigable only by skiffs and outboard motor

*Lat. 47°18′.2, Long. 124°16′.5: Charts 6002, 5020.

boats. Some gasoline and supplies are available. A piling dike has been built along the spit in front of the village; a large amount of driftwood and logs has collected in front of this dike, partially hiding the village; however, the tops of the houses are prominent. In the background, is a ridge with three long, flat summits. A road runs from Moclips to Taholah and a road is under construction between Taholah and Queets.

From Taholah to Cape Elizabeth, the cliffs present an almost unbroken face seaward, and in places are about 200 feet high. They appear either white or bright yellow in color, and from offshore present a very noticeable stratification, sloping downward to the southward, an important difference from the direction of slope around Point Grenville.

Sonora Reef extends south-southeastward from Cape Elizabeth for over 2 miles, its southern end lying 1.1 miles offshore. The reef lies out of the usual course of vessels.

Cape Elizabeth projects about a mile from the general trend of the coast, and when seen from seaward appears as a bright yellow, rocky cliff reaching in places a height of 200 feet. There are no high or large rocks off the cape. A little less than a mile south-southeastward and south-southwestward, respectively, lie two rocks, awash at low water, and inside of these, less than 0.5 mile from the extremity of the cape, are some small visible rocks and breaks. The houses of the **Quinault Indian Reservation** are situated at the eastern end of the cliffs.

From Cape Elizabeth to Destruction Island, a distance of about 20 miles, the coast is nearly straight, with low shores and rocky cliffs heavily wooded to the edges. Numerous rocks lie offshore, but out of the usual track of vessels.

Flat Rock, low and black, lies 1.6 miles 322° from Cape Elizabeth, and 0.9 mile offshore. A sunken rock which breaks in ordinary weather lies 400 yards southward of it. A small low rock lies halfway between Flat Rock and Cape Elizabeth, with a smaller one inside halfway to the beach.

Pratt Cliff, 3 miles northward of Cape Elizabeth, is a sharp point backed by cliffs, 139 feet high.

Split Rock, 70 feet high, lies 3.5 miles 330° from Cape Elizabeth and 1 mile offshore, abreast of the northern end of Pratt Cliff. It is split in two, the division showing when seen from westward to northwestward. A small, low, black rock lies 0.5 mile southward of it, and another, somewhat larger, lies 0.4 mile 170° from Split Rock.

Willoughby Rock, 120 feet high, lies 0.4 mile 57° from Split Rock. It is nearly round with an abrupt seaward face. A cluster of rocks lies between Willoughby and Split Rocks and a little southward of them; one is black and conical, with a rock awash 200 yards southwestward from it.

Sealion Rock, 8 feet high, small and black, lies 3 miles 324° from Split Rock and 2.8 miles offshore.

From Pratt Cliff to **Raft River,** 3.5 miles, the coast consists of broken cliffs over 100 feet high, bordered by rocks extending over 0.5 mile offshore. Midway between them are three rocky heads projecting beyond, and almost detached from the cliffs, and like them, covered with trees to the edges.

Arch Island lies in the entrance to Raft River, and at low water is connected with the southern point of the river. It is 157 feet high and 300 yards long. A vertical pillar, 108 feet high, stands 150 yards north-northwestward of the rocks, and a cluster of rocks lies close-to under its southeastern point.

From Raft River to Queets River, 4.5 miles, the coast consists of cliffs about 80 feet high, broken occasionally by small streams.

Queets River is the largest stream between Grays Harbor and Cape Flattery. The southern point is a low, sandy spit about 0.1 mile long, projecting from an abrupt cliff, 80 feet high, and densely wooded. The northern point is 1.3 miles long, low and sandy, with some trees at the mouth of the river, and a narrow lagoon between it and the bluff.

From Queets River to abreast Destruction Island, about 10 miles, the coast is rather low, and is broken by cliffs about 50 feet high with broad, low-water beaches. **Kalaloch Rocks** lie about 4.5 miles northward of the river, close inshore.

Destruction Island, 90 feet high, lies about 20 miles northward of Cape Elizabeth and 3 miles offshore. It is flat-topped and covered with brush, with a few clumps of trees. It is 0.5 mile long and, at its southern part, 300 yards wide. From the northern end, rocks and ledges extend about a mile from the cliffs; these are bordered by a line of kelp on the inshore side.

Destruction Island Light* is shown from a white conical tower situated on the southwestern part of the island. The light is 147 feet above the water, and visible 18 miles. The light is displayed from 1 hour before sunset to 1 hour after sunrise. The fog signal is sounded on an air siren. There is a radiobeacon at the light.

An indifferent anchorage, affording shelter from northwesterly winds, may be had off the southeastern face of the island, in 12 fathoms, sandy bottom, with the light bearing between 293° and 315°. Vessels must leave if the wind hauls westward or southward. During the fishing season, many small fishing boats anchor for the night under Destruction Island; it is the only shelter from offshore winds between Grays Harbor and Cape Flattery.

*Lat. 47°40′.5, Long. 124°29′.1: Charts 6002, 6102, 5052, 7002, 9000.

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Chapter 15.—DESTRUCTION ISLAND TO AMPHITRITE POINT

(CHART 6102)

This chapter describes the coast of the United States from Destruction Island to Cape Flattery, the coast of Vancouver Island from Carmanah Point to Cape Beale, the islands between the cape and Amphitrite Point, the off-lying banks, and directions for approaching the Strait of Juan de Fuca.

DESTRUCTION ISLAND TO CAPE ALAVA

(CHART 6102)

From abreast Destruction Island at the mouth of **Steamboat Creek** to Hoh Head, about 6.5 miles, the coast trends in a general northwesterly direction; the cliffs are 50 to 100 feet high, with numerous rocks and ledges extending in some cases 1.2 miles offshore.

Abbey Islet, over 100 feet high and covered with trees, lies 200 yards off the cliffs, 3.5 miles northeastward of Destruction Island. A number of rocks lie near it to the southward, the most distant of which is **South Rock,** 46 feet high, which lies 1 mile southward, and 0.5 mile from shore.

Hoh River empties 2 miles eastward of Hoh Head. There is a broad sand beach at its mouth; there are no cliffs for 0.5 mile, which is noticeable for a considerable distance offshore and marks the mouth of the river. In smooth weather, the river can be entered by canoes, but the channel shifts. An Indian village is located on the southern bank at its mouth.

Hoh Head,* 200 feet high, is a bright yellow cliff, covered with a dense forest. It projects a little over 0.5 mile from the general trend of the coast. Sunken rocks extend about a mile southwest by southward from the head, and between it and North Rock, and a large cluster of rocks lies off the southern cliff of the head. A rock with 2¼ fathoms over it has been reported about 1.8 miles westward of Hoh Head.

Middle Rock, 65 feet high, black with vertical sides, lies 0.8 mile off the mouth of the Hoh River and about 1 mile eastward of North Rock. A rock awash lies 0.7 mile from Middle Rock on a line between it and Destruction Island. Numerous low, flat rocks lie between it and the shore.

North Rock, 107 feet high, grayish, with nearly vertical sides, lies a little over a mile southward of Hoh Head. In the afternoon sun, the rock shows white and is a very definite landmark.

Perkins Reef, a long, bold, and jagged islet, lies 1.1 miles westward of Hoh Head. Between it and the shore is a small, visible rock with two sunken rocks near it.

From Hoh Head to Toleak Point, 5 miles, the coast forms two shallow bights, the southern being the longer. The cliffs are from 100 to 120 feet high and are broken by two small streams, one 2 miles northward of Hoh Head and the other 1 mile southward of Toleak Point. Several rocky islets, 25 to 120 feet high, lie in some cases 1.5 miles

*Lat. 47°46′.1, Long. 124°28′.6: Charts 6102, 5052, 7002.

offshore, and numerous rocks and sunken ledges, extending over 2 miles offshore, border this stretch of the coast. A detailed description is not necessary and only the prominent ones will be described.

Alexander Island, 121 feet high, lies 2 miles northward of Hoh Head and a mile offshore. It is 0.3 mile long and 0.1 mile wide, covered with low vegetation, flat-topped with steep sides, and has two lone bushy trees, one on each end of the flat top. It is prominent in hazy or smoky weather. A sunken rock lies 1.8 miles 282° from Alexander Island and is the outermost known danger in this vicinity. A cluster of three sunken rocks lies nearly 0.5 mile southward of the island. A rock, awash at low water, lies 1.1 miles 274° from the island, and a small, bare rock 25 feet high, lies halfway between them. Between the rock, awash, and the beach are two small rocks 44 and 68 feet high.

Toleak Point is a narrow point terminating in a small knob with an abrupt seaward face. A high, wooded islet lies 400 yards westward of the point, and is connected with it by an extensive, bare reef.

Rounded Islet, a round, grassy rock, 130 feet high, with steep sides, lies 0.3 mile seaward of the point. A low black rock lies 0.7 mile southward of it, about 1 mile south-southwestward of Toleak Point.

From Toleak Point to Teahwhit Head, 3.5 miles, the coast is irregular and much broken with numerous outlying rocks and sunken ledges, extending in some cases a mile offshore.

The **Giants Graveyard** is an irregular group of rocks, some of which are wooded, the larger ones varying in height from 88 to 210 feet. They lie 1.5 miles northward of Toleak Point and extend 0.5 mile offshore, the farthest outlying danger being 0.8 mile from the beach.

Teahwhit Head is an irregular, jagged, double point, 100 feet high, and heavily wooded behind the dead trees at the edge of the cliff.

From Teahwhit Head to the Quillayute River, the coast extends for 1.5 miles in high rocky cliffs, changing to a low sand beach 1 mile southward of the mouth of the river.

Huntington Rock, 113 feet high, is the largest of a group of islands and rocks 0.5 mile off the cliffs and 1 mile westward of Teahwhit Head. It is flat-topped and bare, with vertical sides. One of the inner islets is 195 feet high, and another 182 feet high; the latter islet is wooded. One sunken and five low, black rocks extend northward for 0.3 mile from Huntington Rock.

Quillayute Needle, 81 feet high, a little over 0.3 mile southeastward of Huntington Rock, is 35 feet in diameter and nearly vertical. It is the southeasternmost of a line of rocks from Huntington Rock, one of which is 47 feet high and another 73 feet high.

James Island, 183 feet high, lies 15 miles northwestward of Destruction Island, and marks the mouth of the Quillayute River. It is bold, wooded, and connected with the beach at low water. Numerous smaller, wooded islands lie immediately northward of it. These islands are prominent, as the beach northward and southward of them is low, bare, and sandy, and the valley of the Quillayute River, heavily wooded and low, is behind them. An indifferent anchorage, affording some shelter from northwesterly winds, may be had close under and southward of James Island, in 5 to 6 fathoms, sandy bottom, about 600 yards from the beach. Any swell makes the anchorage unsafe.

James Island Light,* on a white house, is located on the southern side of the island;

*Lat. 47°54′.3, Long. 124°38′.9: Chart 6102.

it is 150 feet above the water. Quillayute whistle buoy is moored 1.3 miles 241° from the light.

Lapush is situated abreast James Island, at the entrance to the Quillayute River. There are stores, a hotel, and a post office here; there is daily mail connection with Port Angeles. An oil wharf, with 12 feet at the end, is situated just inside the mouth of the river. Gasoline, oil, and water are available; diesel oil may be obtained in drums. There is a road to **Forks,** which is a point on the railroad, having daily bus service with Port Angeles.

Coast Guard.—There is a Coast Guard station at Lapush; a weather signal tower is located at the station.

Quillayute River enters at the northern end of the sand beach and expands into a basin inside the entrance. The channel has been improved by the construction of a jetty on the easterly side of the entrance and a dike on the westerly side. In 1941, neither the dike nor the jetty showed at high water. The channel passes close to the southeastern shore of James Island. The passage should not be attempted without local knowledge.

The channel, with a controlling depth between the jetty and dike of 3.4 feet in 1941, is tortuous, and dangerous to those not acquainted with it. †In _____ 19____, the controlling depth in the channel was _____. Strangers should approach the buoy off the jetty and lay-to until a Coast Guard boat puts out to pilot them in. The channel is particularly bad in southerly weather, and should not be attempted except at better than half tide and with a full powered boat, when there are any breakers of appreciable size making up across the entrance.

Many fishing boats make their headquarters here during the fishing season. Fishing boats can enter and leave the river at any time during the year except during southerly weather. A boat carries mail to Destruction Island throughout the year.

Mora is situated at the mouth of **Dickey River.** There are stores and a post office and daily mail connections. There is a road to Forks, where a connection may be made with the daily bus to Port Angeles.

From the Quillayute River to Cape Johnson, the coast extends northward for about 3 miles; it has steep, wooded bluffs and a narrow beach.

Cake Rock, 116 feet high, lies 2 miles 315° from James Island and about 1.5 miles offshore. It is about 200 yards long by 100 yards wide, with steep sides and a flat, grassy top, in the middle of which is a small round mound about 20 feet high. Halfway between Cake Rock and the beach is a jagged rock which is 136 feet high. A large low, black rock lies 1.1 miles 351° from Cake Rock and about 1 mile offshore; two other rocks lie 0.3 mile inside of it.

Cape Johnson is small and not particularly prominent. It projects less than 0.5 mile from the general trend of the coast, terminating in a rocky, vertical cliff about 100 feet high, with a mass of rocks at its base. Several high rocks extend 0.5 mile west-northwestward of the cape, the highest being 103 and 127 feet. Three high, rocky pillars lie from 0.5 to 1 mile south-southeastward of the cape and reach elevations of 130, 226, and 125 feet.

From Cape Johnson to Cape Alava, the coast extends in a general north-northwesterly direction for 12.5 miles. The cliffs are not continuous and show bright in but few places; the slopes are densely timbered. Back from the coast, for a distance of 10

†Date and values to be inserted by the navigator from data in the latest Supplement of Notice to Mariners.

or 15 miles, the country rises gradually, to the wooded, snow-capped mountains of the Olympic Range.

Jagged Islet, 78 feet high, lies nearly 2.8 miles 307° from Cape Johnson. It is large, bare, brown, covered with guano, and irregular in outline. A low black rock lies 200 yards northward.

Carroll Islet, 225 feet high, lies 3 miles 322° from Cape Johnson and 0.8 mile 11° from Jagged Islet. It is about 0.1 mile in diameter, and has vertical, whitish sides and wooded top. A pillar rock, 134 feet high, lies 200 yards westward, and a small, low, black rock lies 200 yards off the southeastern side. Carroll Islet and the pillar rock are quite prominent especially when in sunlight.

Bald Islets are two high, bare rocks inside of Jagged and Carroll Islets about 0.8 mile offshore. The outer and larger one is 320 feet high with steep sides; the smaller one is 183 feet high. They are 200 yards apart and between them are two pinnacle rocks, close together. A cluster of small, low, black rocks lies 0.7 mile south-southeastward of the larger islets and five small, black rocks lie between the larger islets and the beach; several low, black rocks lie about 1 mile northwestward.

Hand Rock, 33 feet high, lies 1.5 miles 7° from Carroll Islet and 1.5 miles offshore; it is so named from its shape. The rock is black with a white cap of guano on top. A large rock, 53 feet high, lies halfway between it and the beach, and several low rocks inside the latter.

White Rock, 161 feet high, lies 7.8 miles 358° from Carroll Islet and about 0.8 mile offshore. The rock is 100 yards in extent and has nearly vertical sides and a rounded top; it is whitish in color, and with sun on it, shows for a long distance. The rock is a good landmark. A group of large, low, black rocks lies 0.8 mile south-southeastward of White Rock and 0.8 mile offshore. A small black rock lies in the same direction, distant 1.5 miles. A rock, with a depth of 6 fathoms over it, has been reported 2.2 miles 264° 30′ from White Rock.

CAPE ALAVA TO CAPE FLATTERY

(CHART 6265)

Cape Alava lies about 13.5 miles southward of Cape Flattery, and nearly the same distance northward of Cape Johnson. The seaward face is about a mile in extent, with a steep, rocky islet, 142 feet high and with trees on top, off its northwestern extremity. The shore is bordered by numerous rocks and sunken ledges. The **Ozette Indian Village,** practically abandoned, is situated here. Cape Alava is the westernmost point of continental United States.

Flattery Rocks and Umatilla Reef are a group of rocks and islets extending westward from Cape Alava for a little over 2.3 miles. **Ozette Island,** 236 feet high, lies 1 mile southward of the cape. The island is 0.5 mile long, with a width of 0.4 mile; it is flat-topped and wooded and has steep sides. Off the southern and southeastern sides are low, black rocks, at a distance of 0.3 mile. **Bodelteh Islets** (Flattery Rocks) are two wooded islets with high, bold, seaward faces. The outer one, 198 feet high, lies 1.3 miles westward of Cape Alava; the inner one, 189 feet high, is 100 yards inshore from the outer islet. A bare rock, 141 feet high, lies close under the southwestern face of the outer islet and a rock 132 feet high, whitish in color, with steep sides and a sloping flat top, with two smaller rocks outside of it, lies 200 yards westward of the outer islet.

During the fishing season, a few fish boats find shelter in an anchorage just southeastward of and close-to Ozette Island. The area is small and requires local knowledge to enter. It affords fair protection from the prevailing northwesterly wind.

Umatilla Reef extends for 200 yards in an easterly direction and has a width of 75 yards. It lies 0.7 mile westward of the outer Bodelteh Islet, and consists of several small, low black rocks, and a number of breakers. There is a breaker 1.1 miles 34° from this reef. There is also a rock awash 0.3 mile 88° from the reef. This rock is awash at low tide and makes the passage, sometimes used by small boats, inside Umatilla Reef, dangerous. Umatilla Reef is difficult to make out, especially in thick weather, and is the greatest danger to navigation off the northern part of the coast.

Umatilla Reef Lightship* is moored in 25 fathoms about 2.5 miles southwestward of the reef. It has a red hull with "UMATILLA" on each side, and two masts with a circular gallery at each masthead. The light is 67 feet above the water and is visible 14 miles. The fog signal is sounded on a two-toned air diaphragm horn. Difficulty in hearing the fog signal during a dense fog has been reported, (see Fog Signals on page 36). There is a radiobeacon at the lightship equipped for distance finding; emergency radio messages will be received and transmitted. In very heavy weather, the lightship is sometimes obliged to leave her station.

From Cape Alava, the coast extends northward for about 8 miles, in two shallow bights, and then bends eastward, forming Mukkaw Bay, 3 miles wide, from the northern point of which it trends northwestward for 3 miles to Cape Flattery. The coast is irregular, with alternate stretches of wooded bluffs and rough, rocky cliffs, 100 to 200 feet high. The country immediately back of the beach is not high, but densely wooded.

Point of the Arches lies about 5 miles northward of Cape Alava, and is the northern point of the cliffs extending 1.5 miles southward. Numerous rocks and ledges border the cliffs and extend in some cases 0.8 mile offshore.

Father and Son, two rocks connected by a low reef, lie 0.6 mile offshore abreast the southern end of the cliffs. The outer rock is 167 feet high, and the inner one 65 feet. A rock, 38 feet high, lies 1 mile northward of Father and Son and 0.5 miles offshore, with several rocks between it and the beach.

Spike Rock, 35 feet high, sharp and bare, lies 0.8 mile westward of the Point of the Arches. It is the outermost of a chain of rocks extending from the point, the three largest ranging in height from 152 to 185 feet; there are three arches in these rocks. A rock awash lies 0.4 mile 245° from Spike Rock; it is inside the usual course of vessels.

Portage Head, 7.7 miles northward of the outer Flattery Rock, has a seaward face about a mile in length of bold, rocky, irregular cliffs, over 410 feet high. A reef extends from the point toward Cape Flattery for 1.5 miles, showing several low, black rocks, awash at low water, and one small rock, 45 feet high.

Mukkaw Bay is a shallow bight included between Portage Head and Waatch Point, a distance of 3 miles. It affords indifferent shelter in northerly and easterly weather and a smooth sea, but is little used. The shores are low and sandy. The southern half of the bay is shoal, with reefs and rocks extending about 1.5 miles from Portage Head. The **Sooes River** enters about the middle of the bight. **Waatch Slough** enters in the northern part of the bight immediately eastward of Waatch Point; it is a tidal slough, and the valley through which it runs extends about 2 miles to Neah

*Lat. 48°10′.0, Long. 124°50′.4: Charts 6102, 6265, 6300, 5052, 7002, 9000.

Bay on the Strait of Juan de Fuca. This low depression is one of the features for recognizing Cape Flattery.

Waatch Point, 3 miles southeastward of Cape Flattery, is the southeastern extremity of the cliffs extending to the cape. This stretch is bordered by numerous rocks and ledges.

Fuca Pillar stands 0.2 mile 181° from the western point of Cape Flattery. It is a rocky column, 157 feet high, and 60 feet in diameter, leaning slightly northwestward. It lies 150 yards off the face of the cliffs and is more prominent from northward than from southward.

Cape Flattery is a bold, rocky head, with cliffs 120 feet high, rising to an elevation of nearly 1,500 feet 1 to 2 miles back from the beach. From southward, it is usually raised as an island on account of the low land in the vicinity of Waatch Slough. Numerous rocks and reefs border the cliffs eastward and southward of the cape. About 0.8 mile southward of Cape Flattery are four rocky masses, extending 0.4 mile offshore, and ranging in height from 41 to 88 feet. A rock, which breaks at low water, has been found about 5 miles southward of Cape Flattery and about 2,700 yards 278° from the northernmost point on Portage Head. There is about 2 fathoms on the rock at low tide.

Tide rips are particularly heavy off Cape Flattery.

Tatoosh Island lies 0.4 mile northwestward of Cape Flattery. The main island is about 0.2 mile in diameter, with three smaller ones and several reefs, awash, close-to on its northwestern face. The main island is 108 feet high, flat-topped, and bare. A reef, the outer rock of which is usually awash, extends 0.2 mile westward. The passage between the island and the cape is dangerous; it is restricted by two rocks awash near the center of it, and although used by small boats, it should not be attempted without local knowledge. The currents are strong and treacherous. An overhead wire with but little clearance extends from the island to the mainland.

Cape Flattery Light* is shown from a white conical tower on a gray sandstone dwelling situated on the western end of Tatoosh Island. The light is 165 feet above the water, and visible 19 miles. The light is displayed from 1 hour before sunset to 1 hour after sunrise. The fog signal is sounded on an air diaphone. There is a radiobeacon equipped for distance finding.

A radio direction finder station is located on the island, and day and night storm warnings are displayed by the Weather Bureau. There is telegraphic communication, and vessels can be reported, or can send messages.

A rocky patch, having a least depth of 7 fathoms, and on which the sea breaks occasionally in a westerly swell, lies 1.4 miles 231° from Cape Flattery Light.

Duncan Rock, small, low, and black, lies 1 mile 347° from the light. A ledge, with 4 fathoms over it, lies 0.4 mile 131° from Duncan Rock, and a sunken rock between them 250 yards off on the same bearing. Another sunken rock lies 250 yards from Duncan Rock in the direction toward the light. These dangers contract the passage between Duncan Rock and Tatoosh Island to less than 0.5 mile. Although narrow, many large vessels use this passage, favoring Tatoosh Island. However, strong currents and tide rips are encountered here, which added to the narrownesss of the passage, make its use inadvisable.

Duntze Rock, with 3¼ fathoms over it, lies 0.2 mile 346° from Duncan Rock and almost in line with it and the light.

There is a lighted whistle buoy 1.5 miles 339° from Cape Flattery Light.

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*Lat. 48°23′.5, Long. 124°44′.1: Charts 6102, 6265, 5052, 7002, 9000.

CAPE FLATTERY TO AMPHITRITE POINT

(CHART 6102)

Swiftsure Bank, about 3.5 miles in extent within the 30-fathom curve, lies off the mouth of Strait of Juan de Fuca, northwestward of the submarine valley making into it. The least depth found upon it is 19 fathoms.

Swiftsure Bank Lightship is moored 13.8 miles 311° from Tatoosh Island Light, and 10.5 miles 247° from Carmanah Light. It has a red hull with "SWIFTSURE" on each side and is two masted. The light is 65 feet above the water, and visible 14 miles. A fixed white riding light is carried on the forestay at a height of 20 feet. The fog signal is sounded on an air diaphone. There is a radiobeacon equipped for distance finding; emergency radio messages will be received and transmitted. In heavy weather the lightship occasionally drags anchor and sometimes is obliged to leave her station.

Caution.—All vessels approaching Swiftsure Bank Lightship during fog should observe extreme caution as numerous small fishing vessels anchor nightly, within a radius of 8 miles of the lightship, during the fishing season from June 1 to November 1.

The coast from Carmanah Point to Cape Beale is a very dangerous one and, except during fine weather and offshore winds, should be given a wide berth.

Carmanah Point is on the Vancouver Island shore, about 13 miles northward of Tatoosh Island. **Carmanah Light,** located on the point, is shown from a white octagonal concrete tower with a red lantern. The light is 175 feet above water, visible 19 miles. A fog signal is sounded on an air diaphone.

Clo-oose, a small village and mission, is about 5.5 miles westward of Carmanah Point in the small cove at the mouth of the **Chuckwear River,** eastward of the entrance to Nitinat Lake. The village is connected with the Government telegraph line to Victoria, and by telephone with Carmanah Light. Shelter and assistance can be obtained here.

A reef, 0.8 mile long in a northwesterly direction, with a rock, awash, in its center, lies off this cove. It is marked by a lighted whistle buoy moored 0.8 mile southwestward of the rock.

Nitinat Lake, 12 miles long and about 0.5 mile wide, enters the strait about 1.5 miles westward of Clo-oose. The depths at the entrance vary from 1 to 2 fathoms, and in bad weather the sea breaks entirely across it. The entrance is dangerous and should not be attempted except at slack water by those with local knowledge.

Tsusiat, 3 miles westward of Nitinat Lake, is a conspicuous waterfall which may be seen at a considerable distance, even in hazy weather, and may be used to help fix a vessel's position, as it is the only waterfall on this part of the coast.

Behind Tsusiat the mountains rise to a height of more than 2,000 feet.

Pachena Point is about 25 miles northwestward of Cape Flattery and has depths of 15 fathoms fairly close in. **Pachena Light** is shown from a white pyramidal wood tower with a red cylindrical lantern. The light is 200 feet above water, and visible 20 miles. A fog signal is sounded on an air diaphone. There is a radio direction finder station near the light, at a white square building with a red roof attached to a dwelling.

Pachena Bay lies between Pachena Point and Cape Beale. It is about 2 miles long and 0.5 mile wide, with depths of 5 to 6 fathoms. There is usually a heavy swell entering the bay, and vessels should not attempt to anchor. At the head of the bay, on the western side, is a small stream into which boats can go and find shelter in rough weather.

Seabird Islet, off the entrance to Pachena Bay, is about 48 feet high, bare, and of small extent. Two rocks lie off the islet; one 0.5 mile 132° and the other 0.5 mile 219° from it, the latter being awash at high water. There is no safe passage between Seabird Islet and the shores northeastward, and the islet should not be approached closer than 1.5 miles.

Cape Beale is a bold, rocky point, 120 feet high, or 300 feet to the tops of the trees. A reef with rocks above and below water, extends about 0.8 mile southwestward from it. It has a rescue station, a depot for provisions and necessities for shipwrecked mariners being maintained there.

Cape Beale Light is shown from a white square structure attached to a dwelling situated near the western extremity of the cape which is about 20 miles westward of the entrance to the strait. The light is 171 feet above the water, and visible 19 miles with a red sector from 97° to 182°. The fog signal is sounded on an air diaphone installed on a white building midway between the light and the water. A signal station connected to Victoria by telegraph is maintained at the light.

Barkley Sound, an extensive arm of the sea about 31 miles northwestward of Cape Flattery, lies between Cape Beale and Amphitrite Point. It is 15 miles wide at its entrance, and though encumbered by numerous islands and rocks, it maintains a breadth of 13 miles for 8 miles inland, above which it separates into several narrow inlets. The shores are low, except in the northern part and among the inlets, where they become high, rugged, and mountainous.

In the western part of the sound are innumerable rocks and islands, with navigable channels between them. Entrance should not be attempted without local knowledge or a pilot. Imperial Eagle Channel is the easiest of access.

The principal channels in the sound are as follows: **Trevor Channel,** the easternmost, is 12 miles long in a northeasterly direction, and its breadth varies from 0.5 to 1.5 miles; its shores are low and rugged, except in the northeastern part where they are high and rugged. **Imperial Eagle Channel,** the largest passage into Barkley Sound, is about 12 miles long, 3 miles wide in the narrowest part, and bounded on either side by numerous small islands, rocks and part of the mainland; **Deer Islands** on the east, and **Broken Group Islands** on the west. **Loudoun Channel,** leading into the sound, westward of Broken Group, between it and **Sargison Bank,** is from 1 to 2 miles wide.

Amphitrite Point is the western entrance point of Barkley Sound. **Amphitrite Point Light*** is shown from a white rectangular concrete building with a rounded front, surmounted by a red octagonal lantern located on the end of the point. The light is 58 feet above water, and visible 13 miles. A fog signal is sounded on an air diaphragm horn. A whistle buoy is moored about 1,050 yards southward of the point.

A more detailed description of Barkley Sound will be found in the publication *Sailing Directions for British Columbia, Volume I,* which is Hydrographic Office Publication 175.

DIRECTIONS, APPROACHING AND ENTERING THE STRAIT OF JUAN DE FUCA

In clear weather, no difficulty will be experienced in approaching the entrance of the Strait of Juan de Fuca from any direction, as the land on both sides is high, and Cape Flattery, the southern point at the entrance, is readily distinguished, particularly from southward, on account of the low land between Mukkaw and Neah Bays. Cape

*Lat. 48°55′.5, Long. 125°32′.3: Charts 6102, 7002, 9000.

Beale, the eastern point at the entrance to Barkley Sound, on the Vancouver Island shore, about 20 miles westward of the entrance to the strait, is marked by a light and fog signal. Pachena Light, Carmanah Light, Cape Flattery Light, Umatilla Reef Lightship and Swiftsure Bank Lightship, mark the approaches and have fog signals. In thick weather, the soundings also will assist in estimating approximately the distance from shore.

Soundings.—The soundings in the approaches to the Strait of Juan de Fuca are very irregular, especially outside the 50-fathom curve. There is a deep submarine valley, with depths of over 100 fathoms and a width of 2 to 4 miles, between the 100-fathom curves, which leads from about 37 miles south-southwestward of Cape Flattery, rounds this cape at a distance of 2 miles, and extends about 32 miles into the strait. The 100-fathom curve on the western side of this submarine valley is very irregular, but on the eastern side it is more regular. Within the strait this curve is regular on both sides of the valley.

The southern extremity of this valley is about 26 miles offshore, and from the western side of this extremity, the seaward 100-fathom curve extends in a northwesterly direction and lies about 40 miles southwestward of Cape Flattery and 35 miles southwestward of Cape Beale.

On the eastern side of this valley the 100-fathom curve lies about 20 miles southwestward of Destruction Island, and trends in a northwesterly direction for about 40 miles. It then runs northeastward toward the Umatilla Lightship for about 12 miles and then northward for about 20 miles, passing about 5 miles westward of the Lightship. It then turns north-northeastward and passes close outside of Duntze Rock, and then sharply eastward into the strait for about 30 miles. The 100-fathom curve on the western side of the valley is too irregular for description, and the chart must be consulted for details.

In thick weather, therefore, if the 100-fathom curve is followed for 20 miles or more in a northwesterly direction and is found to change to the eastward, a vessel is probably in the valley about 15 to 20 miles southwestward of Umatilla Reef Lightship; but if the direction of the curve changes to the westward she may be on the outside of the bank about 40 miles west-southwestward of Cape Flattery Light.

The 50-fathom curve is less complicated southward of the strait. From about 25 miles southward of Cape Flattery, it runs in a general north by west one-half westerly magnetic direction and passes 3 miles westward of Umatilla Reef Lightship. It then curves gradually northward toward Cape Flattery and passes close to Duntze Rock. Vessels from southward, following this curve in thick weather, ought to hear the fog signal, both at Umatilla Reef Lightship and at Cape Flattery, and thereby verify their position.

Currents.—The currents at Swiftsure Bank and Umatilla Reef Lightships are described on page 34. Off the entrance of the Strait of Juan de Fuca, the coastal current is augmented by the current from the strait. On the flood, there is a set into all the sounds on the Vancouver Island shore, and this, combined with the prevailing northwesterly current and light southerly winds, with possibly some swell from the same direction, makes the coast in the vicinity and westward of Carmanah Light dangerous, especially for small vessels.

The flood current entering the Strait of Juan de Fuca sets with considerable velocity over Duncan and Duntze Rocks, but instead of running in the direction of the channel there is a continued set toward the Vancouver Island shore, which is experi-

enced as far as Race Rocks. The flood current has also more velocity on the northern shore of the strait than on the southern.

The ebb current is felt most along the southern shore of the strait, and between New Dungeness Lighthouse and Crescent Bay, there is a decided set southward and westward, especially during spring tides. With wind and swell against the current, short, choppy sea is raised near the entrance to the strait.

For additional information on currents in the Strait of Juan de Fuca see page 259.

A general description of the conditions which may be encountered and of the precautions which should be observed, including directions for approaching from southward, is given in the statement on Coastwise Navigation, beginning on page 37.

From seaward, vessels should pick up the 100-fathom curve and be guided by the soundings. The relation between the 100- and the 50-fathom curves is the best indication for fixing the position, and vessels should not get inside the latter depth until a fix has been obtained. From seaward the mountain peaks in the interior can sometimes be seen when the coast is obscured by fog.

On this portion of the coast, the tendency toward a northerly set inshore is much more pronounced than farther southward. The great majority of the strandings which have occurred have been on the Vancouver Island shore, and allowance should be made accordingly.

Sailing vessels, approaching the strait, should keep well off the mainland coast southward of Cape Flattery, unless working to windward against a fine northerly wind, which is frequently found during the summer, in which case the coast may be approached to within 3 miles. At other times there is no inducement to hug the coast, on which a long rolling swell frequently sets, and this swell, meeting the southeasterly gales of winter, causes a confused sea. The cape and its off-lying dangers should be given a berth of at least 3 miles, as the tidal current sometimes sets with great velocity toward Duncan and Duntze Rocks. It is equally necessary, when entering or leaving the strait, to avoid the coast of Vancouver Island between Port San Juan and Bonilla Point, when there is any appearance of bad weather.

Sailing vessels making the strait during the winter months, especially during November and December, and experiencing the easterly and southeasterly winds prevalent at that season, should endeavor to hold a position southward or southwestward of Cape Flattery, and should on no account open the entrance of the strait until an opportunity offers of getting well inside. It is also important to remember that, though it may be blowing strongly from the southward or south-southwestward outside, on rounding Cape Flattery, an easterly wind may be found blowing out of the strait, and a vessel would then find the Vancouver Island coast a dangerous lee shore.

Coming from the westward with a heavy westerly or northwesterly gale and thick weather, vessels uncertain of their position, should lie-to at not less than 30 miles from the entrance or on the edge of the bank of soundings. These gales seldom last more than 12 hours, and if they veer toward the southwest the weather will clear and vessels may bear up for the strait.

In approaching the Strait of Juan de Fuca, use may be made of the **radio direction finder and radiobeacon stations** as follows: From the southward, the Oregon stations and Destruction Island may be used until the latitude of Destruction Island is reached when Tatoosh Island should be used. A course to pass about 5 miles off Umatilla Reef Lightship is desirable to allow an ample margin of safety. Klipsan Beach may begin to get erratic when nearing Umatilla Reef Lightship, and from this point Destruction

Island and Tatoosh Island should be used on this leg of the run. For rounding Cape Flattery, chief reliance should be placed on bearings from Tatoosh. Using a series of bearings obtained at frequent intervals and plotting the run between them, the vessel can be taken around Cape Flattery, keeping in about the center of the strait, without difficulty. After a bearing of 270° from Tatoosh Island is reached, New Dungeness can be used to secure good fixes. If fairly close to the Vancouver Island side of the strait, New Dungeness bearings may develop some error and have a tendency to show the vessel closer inshore than she actually is. This is probably due to the fact that a part of Vancouver Island is between the station and the vessel.

After rounding Cape Flattery, bearings from Tatoosh can be used until a bearing of 90° is reached; by this time the vessel will be well inside the strait. It is advisable to get on a bearing of about 280° from New Dungeness and steer a course of 100°. Such a course will carry the vessel clear of all dangers until after Race Rock is passed. Bearings from Tatoosh in the sector from 220° to 245° are apt to show a variable error of as much as about 2°. This is due probably to the influence of the high ground on Cape Flattery back of the radio station, causing reflections of the radio waves. This possible error will not be sufficient to give trouble when close to Tatoosh and making the run into the strait, but if the approach is made from a southwesterly direction from seaward, the bearings are apt to be erratic beyond a distance of about 40 miles from Tatoosh Island.

In making the approach to the Strait of Juan de Fuca along the great circle course from the Orient, an approximate position can be obtained when about 75 miles from Tatoosh Island by using bearings from Tatoosh Island and Destruction Island. The fixes obtained will be increasingly accurate as the vessel nears Cape Flattery. New Dungeness will help to give strong fixes when the vessel is within a distance of about 30 miles from Tatoosh Island. New Dungeness is so placed as to carry a vessel directly into the strait and about all that is necessary is to get on a bearing that is well clear of dangers and run it down. Until well inside the strait, Tatoosh can be used with New Dungeness to check the position of the ship.

Courses from the south are given in Table 6 on page 45.

Fog.—The fogs are generally heavier near the entrance, decreasing in density and frequency up the strait. Near the entrance, the fog sometimes stands like a wall, and vessels entering the strait run out of it into clear, bright weather, even before passing Tatoosh Island. These fogs frequently extend a long distance seaward, and when combined with the smoke from forest fires, become exceptionally dense. The wind gradually works the fog into the strait, and it will follow the northern shore past Port San Juan to the Sombrio River; occasionally it will reach as far as Sooke Inlet and at times to Race Rocks. As a rule, however, the fog follows farther into the strait along the southern shore, at times reaching Port Townsend; frequently the northern shore is clear when the southern shore is enveloped in fog. See fog signal Race Rocks Light, page 261.

During the spring, fogs are frequent in the strait; with a westerly wind they often stop at the headland between Crescent and Freshwater Bays, the fog then extending westward, while it is clear to eastward. When fogs extend past Freshwater Bay, the small area about the western bight will often be clear.

Wind and rain.—In summer, the prevailing northwesterly winds draw into the strait, increasing toward evening, and at times blowing a 10-knot breeze before midnight. This occurs, however, only when the winds are strong outside. In light winds, sailing vessels may be a week from Cape Flattery to Admiralty Inlet, and vice versa.

In winter, southeasterly winds draw out of the strait, causing a confused cross sea off the entrance, the heavy southwesterly swell meeting that coming out. Under these conditions, outward-bound vessels, especially sail, often make Neah or Clallam Bays and await more favorable weather. The weather off the entrance is as a rule exceptionally severe, and wrecks are of frequent occurence. The heavy broken seas are probably due to the shoaling off the entrance, the irregularity and velocity of the currents, and the conflict between the wind drawing out of the strait and that along the outer coast.

The rainfall in the vicinity of the entrance is considerable, even during the summer months; the heaviest rains occur during December, January, February, and March.

For meteorological data for Tatoosh Island, see the meteorological tables in the appendix to this volume.

Chapter 16.—STRAIT OF JUAN DE FUCA AND GEORGIA STRAIT

(CHART 6300)

This chapter describes the Strait of Juan de Fuca from the entrance to Admiralty Inlet, the San Juan Archipelago, and Georgia Strait to Ballenas and Bowen Islands.

STRAIT OF JUAN DE FUCA

(CHART 6300)

The **Strait of Juan de Fuca** separates the southern shore of Vancouver Island from the northern coast of the State of Washington. The entrance to the strait lies between parallels of 48°23′ N. and 48°36′ N., on the meridian of 124°45′ W. This important body of water is the connecting channel between the ocean and the island passages extending southward to Puget Sound and northward to the inland waters of British Columbia and southeastern Alaksa.

The commerce of this region is extensive, both foreign and domestic. Vast quantities of lumber and fish, also grain, coal, and general merchandise are exported, while the manufacturing and shipbuilding industries are important. Several transcontinental railroads have their western terminals on Puget Sound and Georgia Strait, and there are several lines of steamers, foreign and domestic, operating across the Pacific or through the Panama Canal, in addition to the coasting and local steamers, and sailing vessels.

At its entrance and for 50 miles eastward to Race Rocks, the strait has a width of about 12 miles, and thence it has a width of about 18 miles for 30 miles, eastward to Whidbey Island, its eastern boundary. The depths, as a rule, are deep to within a short distance of the shore, with but few outlying dangers, most of which are in the eastern part. The shores on both sides are heavily wooded, rising rapidly to elevations of considerable height, and except in a few places, are bold and rugged.

The northern shore should be avoided, as it is the lee shore for most gales, and, with the exception of Esquimalt Harbor, there are no anchorages for strangers that afford shelter from all winds.

The navigation of these waters is simple in clear weather. The aids to navigation are numerous, and the chart is a good guide. In thick weather, because of strong and irregular currents, extreme caution and vigilance must be exercised. Strangers should take a pilot.

Radio direction-finder stations on Tatoosh Island and on Pachena Point, Vancouver Island, afford the navigator an excellent opportunity for frequently fixing his position in approaching the Strait of Juan de Fuca. In addition the Swiftsure Bank Lightship is equipped with a radiobeacon.

Pilotage.—All vessels are subject to pilotage eastward of Port Angeles, inside the international boundary line extending southward to and including Olympia, except

vessels under enrollment and vessels engaged exclusively in the coasting trade on the west coast of continental United States, including Alaska, and/or British Columbia.

Port Angeles has been designated as the pilotage station for all vessels enroute to or from the sea. On vessels enroute to or from British Columbia ports, pilotage will apply at the international boundary line. Pilotage dues as fixed are $1.15 per nautical mile with a minimum fee of $25.00 for any pilotage service, except that the charge of shifting a vessel from one dock to another in the same port is $15.00. "Rules and Regulations," and complete rates may be obtained from the "Board of Pilots Commissioners," Seattle.

Pilots may be obtained at Port Angeles, or upon request, at the Puget Sound Pilots Association, Seattle.

In British Columbia pilotage is not compulsory and need be paid only if a pilot is employed. Pilots may be obtained on application at Vancouver or Victoria. A boarding station has been established within a radius of 7 miles of Race Rocks.

Towboats will be found in Neah Bay and can be had by signaling the lighthouse on Tatoosh Island.

Towage rates for the Strait of Juan de Fuca and adjacent waters are published by the Northwest Towboats Association, Seattle, from whom they may be obtained upon request. The rate for towage from Neah Bay to Seattle varies from $313.00 for a vessel of 151 gross tons, to $2,034.00 for a vessel of 10,000 gross tons.

Quarantine.—The quarantine station is at Port Angeles and is under the supervision of the officer at the relief station. Ships under quarantine anchor in the bay off the city wharves.

Currents, Cape Flattery to Race Rocks.—The currents attain velocities of 2 to 4 knots, varying with the range of tide, and are influenced by strong winds. Eastward of Race Rocks, in the wider portion of the strait, the velocity is considerably less. At Race Rocks and Discovery Island, the velocity is 3 to 6 knots or more. Along the Vancouver Island shore, the currents turn about 1½ hours earlier than on the Washington shore of the strait, and advantage is frequently taken of this by vessels having an adverse current in the strait.

The **flood current** entering the Strait of Juan de Fuca sets with considerable velocity over Duncan and Duntze Rocks, but instead of running in the direction of the channel, there is a continued set toward the Vancouver Island shore which is experienced as far as Race Rocks. The flood current has also more velocity on the northern shore of the strait than on the southern.

The **ebb current** is felt most along the southern shore of the strait, and between New Dungeness Light and Crescent Bay, there is a decided set southward and westward, especially during spring tides. With the wind and swell against the current, a short choppy sea is raised near the entrance to the strait.

The current movement is complicated by a large daily inequality, and the *Pacific Coast Current Tables*, published annually in advance by the United States Coast and Geodetic Survey should be consulted for times and velocities.

Tide rips occur off the prominent points and in the vicinity of the banks. These are particularly heavy off Cape Flattery, Race Rocks, Dungeness Spit, and Point Wilson, at times becoming dangerous to small vessels.

Directions.—Courses for the Strait of Juan de Fuca are given on page 48.

STRAIT OF JUAN DE FUCA, NORTHERN SHORE

(CHART 6300)

Carmanah Point is described on page 252.

Bonilla Point, the northern entrance point at the western end of the strait, lies about 1.8 miles east-southeastward from Carmanah Light. Inland of Bonilla Point, which slopes gradually to the sea, the mountains attain heights up to 3,515 feet and are heavily wooded. A conspicuous house is situated about 0.5 mile eastward of the point. A reef extends 0.5 mile off the point, and the shores should be given a berth of at least 1.5 miles.

From Bonilla Point, the coast trends in an easterly direction for 9.5 miles to Owen Point. It is nearly straight, rocky, and bluff, with high mountains rising immediately behind it, all heavily wooded. Vessels are apt to lose the wind near the shore.

Port San Juan offers the first anchorage on the northern shore within the entrance to the Strait of Juan de Fuca. The port is conspicuous from seaward, appearing as a deep gap between two mountain ranges.

The entrance, between **Owen Point** and **San Juan Point,** 2 miles wide and 3½ miles long, lies 13 miles northeastward of Cape Flattery Light. It is marked by a lighted whistle buoy which is situated in midchannel and may be passed close-to on either side.

Anchorage.—The port is open to southwesterly winds, and a heavy sea rolls in when a moderate gale is blowing from that direction. Though it is possible that a vessel with good ground tackle could ride out a gale if anchored in the most sheltered part, it is recommended that, with any indication of southwesterly gales, a vessel should weigh anchor immediately, and if outward bound, seek shelter in Neah Bay (page 265).

Anchorage may be had in depths of 6 to 9 fathoms anywhere in Port San Juan; a good position is in a depth of 6 to 8 fathoms about 1.5 miles from the beach at the head of the port.

Observatory Rocks, off San Juan Point, are high pinnacles with a few trees growing on them, and some smaller offlying rocks, the outermost of which lies 300 yards from shore. About 800 yards northward of these rocks, and 300 yards from shore, is another reef, partly out of water.

Port Renfrew is a settlement with telephone facilities and a post office, situated on the southeastern side of Port San Juan about 2 miles northeastward of San Juan Point. A substantial wharf is available; it has a length of 900 feet and a depth alongside of 15 feet.

From Port San Juan the coast trends eastward for 23.5 miles to Sheringham Point. This stretch of coast presents no prominent features. The country is thickly wooded and the land rises to a considerable elevation. The points, some of which are bare on their extremities, are not prominent nor are they easily identified, except from close inland.

From Port San Juan to Race Rocks, fish traps and broken piles are reported to extend, in places, 0.5 mile offshore.

SHERINGHAM POINT TO ESQUIMALT HARBOR

(CHART 6382)

Sheringham Point is marked by a light on a white hexagonal concrete tower having a white dwelling with a red roof attached. **Sheringham Point Light*** is 72 feet above

*Lat. 48°22′.6, Long. 123°55′.2: Charts 6300, 6102, 6382.

the water, and visible 14 miles. The fog signal is an air diaphone sounded from a white square wooden building close southward of the light.

From Sheringham Point, the coast continues in an easterly direction for 16.5 miles to Race Rocks, and consists of a number of bays or inlets including **Sooke Bay, Sooke Inlet,** and **Becher Bay,** none of which are of more than local importance.

Race Rocks, a cluster of low, bare islets or rocks, the outermost lying about 1 mile southeastward of Bentinck Island, occupy a space of about 0.5 mile in extent. With the exception of **Great Race Rock,** which is 200 yards long and 30 feet high, they are small, a few feet above water or awash at low water. For a distance of about 0.5 mile southeastward of the group, the bottom is foul and during bad weather, heavy, dangerous overfalls and races occur. In light winds, sailing vessels should give this group a good berth, especially when to the eastward of them, as the ebb sets in their direction.

Race Rocks Light is shown from a circular stone tower, painted in alternate black and white horizontal bands with a dwelling attached. The light is 118 feet above the water, and visible 18 miles. The fog signal is sounded on an air diaphone. *Four short blasts,* in answer to the fog signal of a vessel in the strait, will indicate that the northern portion of the strait is clear of fog.

A radiobeacon is maintained at Race Rocks Light.

Rosedale Rock, with a least depth of 3 feet, lies 0.4 mile southeastward of Race Rocks Light. Rocky, uneven bottom, with depths of 5 to 8 fathoms, extends 0.5 mile eastward of the rock. A buoy is moored 200 yards southward of the rock, which should be given a berth of not less than 1 mile to avoid the tide rips and currents in its vicinity, which set toward it and the reefs near it with great velocity.

Eastward of Race Rocks, the Strait of Juan de Fuca expands to a width of about 16 miles, and extends for 30 miles east-northeastward to the entrance to Admiralty Inlet on the south, see page 317, and Rosario Strait on the north, see page 291. San Juan Archipelago, comprising the numerous channels and islands northward of its eastern end, is described on page 273.

A 25-fathom bank lies about 8.5 miles southeastward of Race Rocks, along the steamer track from Race Rocks Light to Point Wilson Light. The western edge of this bank is sometimes sharply defined by a line of ripples with glassy calm water to the eastward.

Race Passage with a width of about 0.5 mile, leads between the dangers off Bentinck Island and those of Race Rocks. Because of the strong tidal currents and the races caused by the irregular nature of the rocky bottom, this passage is not recommended.

Bentinck Island, about 150 feet high and 1,200 yards long, lies off the shore between **Christopher Point** and **Edye Point,** about 1 mile northeastward. The island is fringed with kelp on its southern and eastern sides, and like the adjacent land, covered with pine trees. An islet, 7 feet high, lies close off George Point, the southeastern extremity. The Government leper station is situated on Bentinck Island. **Pedder Bay, Parry Bay,** and **Royal Roads,** separated by William Head and Albert Head, form the coast between Bentinck Island and the western entrance to Esquimalt Harbor.

William Head is a comparatively low promontory extending about 0.5 mile northeastward of **Ned Point.** The southeastern side of this promontory is foul for a distance of about 200 yards offshore.

The **quarantine** station for Victoria and other ports is situated on William Head. All vessels from foreign ports are required to call here and cannot make customs entry at any port in Canada until pratique has been granted. Reciprocal quarantine inspection

has been arranged between Canada and the United States; vessels from foreign ports destined for both American and Canadian ports within the Strait of Juan de Fuca, shall undergo inspection at the primary port of arrival, such inspection ordinarily being sufficient for entry at the port of the other Government.

Because of the difficulty in anchoring off William Head in thick weather, pratique will be granted in Royal Roads if so desired, but in thick weather only. Vessels should notify the quarantine station by radio of their expected time of arrival and, if thick weather is encountered here, they should haul in close enough to make their fog horns at the station and then proceed to Royal Roads; the quarantine officer will follow and give pratique.

Anchorage may be had northward of William Head; a good position is in a depth of 7 fathoms about 0.5 mile northward of William Head and about 1,200 yards from the mainland.

William Head Light is shown from black pyramidal steel frame work on the northeastern extremity of the head. The light is 37 feet above water. A fog signal is sounded on an air whistle.

Constance Bank, with general depths of 10 to 13 fathoms, about 2 miles long and 1 mile wide, is within the 20-fathom curve. The least depth of 9 fathoms lies near the northern end of the bank at about 6.8 miles eastward of William Head Light. The bottom is rocky and tide rips are formed in this vicinity. Vessels should not attempt to anchor on the bank.

Albert Head Light, on the southeastern extremity of the headland, is shown from a structure consisting of a black, square steel tower surmounted by a white, slatted daymark. The light is 88 feet above the water and visible 14 miles. The fog signal is sounded on an air diaphone.

Fisgard Island Light,* on the western side of the entrance to Esquimalt Harbor, is shown from a white circular black tower attached to a red brick dwelling. The light is 67 feet above the water, visible 12 miles. There is a red sector from 195° to 332°. To clear **Scrogg Rocks** off the eastern entrance point of Esquimalt Harbor, the light must show white in approaching from the eastward.

ESQUIMALT HARBOR TO WHIDBEY ISLAND

(CHART 6380)

Esquimalt Harbor affords safe and commodious anchorage, and with the light on Fisgard Island, can be entered at any time. The entrance channel with general depths of 8 fathoms leads between Duntze Head and the dangers off **Fisgard Island,** and has a width of 400 yards. Immediately within the entrance, the harbor is broadened to a width of 1 mile by **Constance Cove** and farther northward, **Plumper Bay** also widens the harbor. Depths within the entrance gradually decrease for 1.5 miles northward to **Cole Island,** above which the head of the harbor dries. Constance Cove is reserved for British naval vessels eastward of a line from Duntze Head to **Ashe Head.** Plumper Bay lies northward of **Inskip Island;** in the southeastern part of the bay is a cannery, off which are two mooring buoys.

Anchorage.—Safe anchorage, in not less than 4 fathoms, may be had in any part of Esquimalt Harbor as far northward as Dyke Point, the northern entrance point of **Thetis Cove,** in the northeastern part of Plumper Bay. This cove offers suitable an-

*Lat. 48°25′7, Long. 123°26′8: Charts 6300, 6380, 6382.

chorage for small craft. Some parts of the harbor are open to direct southerly winds but they seldom blow and there is never sufficient swell to render anchorage inconvenient. If intending to make a lengthy stay, vessels should moor, for the winds are variable.

Victoria Harbor, which is landlocked and well protected, lies about 2 miles east-southeastward of Esquimalt Harbor, and can accommodate the largest vessels.

Victoria Harbor is entered between **Macaulay (Sailor) Point** on the west, and the breakwater extending from **Ogden Point** on the east. The harbor extends for more than 0.5 mile northward to **Shoal Point** on the eastern side, and thence trends eastward to **James Bay.** From the northern extremity of James Bay, the upper harbor which is crossed by three bridges, extends about 0.8 mile north-northwestward to **Selkirk Water,** the western extremity of which is connected to **Portage Inlet.** Between Macaulay Point and the breakwater, the depths are 35 to 80 feet, decreasing northward, and off Shoal Point they are 18 to 22 feet. In James Bay and between Shoal Point and the upper harbor, the depths vary from 18 feet to 27 feet; in the southern part of the upper harbor, the depths are 15 to 21 feet, and in the northern part, they are from 10 to 13 feet. In Selkirk Water, the depths in the channel are from 6 to 10 feet.

Brotchie Ledge, the only outlying danger, about 200 yards in extent within the 5-fathom curve, lies about 900 yards southwestward of **Holland Point,** on the eastern side about 750 yards southeastward of Ogden Point; the ledge has a least depth of 12 feet. **Brotchie Ledge Light** is shown from a black conical base with a black square framework top. The light is 22 feet above the water and visible 9 miles. This light must not be depended on. A fog signal is sounded on a bell.

Ogden Point Breakwater Light, on the outer end of the breakwater, is shown from a white pyramidal concrete tower. The light is 40 feet above the water and visible 11 miles.

Clover Point, located about 2 miles southeastward of the entrance to Victoria Harbor, is low, bare of trees, and steep-to. Strong tide rips which are formed off the point, are dangerous to boats.

Trial Islands, about 4 miles eastward of Victoria Harbor, are bare and rocky; from most directions the two islands appear as one. The southern, and larger island is 80 feet high, and from **Ripple Point,** its southern extremity, a rocky ledge, which dries 2 feet, extends about 100 yards. The northern island is 25 feet high, and from it foul ground extends halfway towards **Bold Point** and about 400 yards towards the middle of **McNeil Bay.** Severe tide rips are formed off Ripple Point, especially on the flood tidal current, which attains a velocity at springs from 3 to 6 knots. The point should be given a wide berth.

Trial Islands Light, near the southern extremity of the islands, is shown from a white square wooden dwelling, having a red roof, surmounted by a red cylindrical lantern. The light is 85 feet above the water and visible 15 miles.

Discovery Island, about 2 miles northeastward of **Gonzales Point,** lies at the junction of Haro Straight, see page 273, and the Strait of Juan de Fuca. The island is wooded, and near its southeastern extremity, **Pandora Hill** attains a height of about 125 feet. On all sides of the island the shores are fringed with rocks, in some places extending as far as 600 yards offshore. The eastern end of the island is fringed with rocks, the outermost of which dries 9 feet and lies about 350 yards north-northeastward of **Seabird Point,** the eastern extremity of the island.

Discovery Island Light* is shown from a white square wooden tower with a dwelling

*Lat. 48°25′.5, Long. 123°13′.4: Charts 6300, 6380, 6382.

attached, on the eastern extremity of the island. The light is 91 feet above the water and visible 15 miles. The light is obscured from 54° to 161°. The fog signal is an air diaphone sounded from a white square wooden structure close eastward of the lighthouse.

A bank with depths of 13 to 20 fathoms, extends about 1.5 miles in a northeasterly direction, and its shoalest part lies about 7.8 miles southward of Discovery Island.

Hein Bank, with a least depth of 2¼ fathoms, lies about 8 miles 283° from Smith Island Light; it is about 2 miles long in a northerly direction, within the 10-fathom curve, and 0.8 mile wide. The shoalest part of the bank is covered with thick kelp in summer. On the north, east, and western sides of the bank the water deepens quickly; at its southern end the bank is continued for over 2 miles within the 20-fathom curve with a width of 1 mile. It is marked by a lighted bell buoy moored close northward of the shoalest part of the bank.

A 1¾-fathom rocky patch has been reported at the northern end of Hein Bank about 1.3 miles 20° from the 2¼-fathom shoal which is marked by the lighted bell buoy. A 3-fathom shoal is reported about 0.8 mile 238° from the 2¼-fathom shoal.

Smith Island lies 5 miles westward of Whidbey Island and 6.5 miles north-northwestward of Point Partridge. It is irregular in shape and about 0.5 mile in extent. At its eastern end, it is low, but rises abruptly to an elevation of 55 feet at its western end, terminating in a white perpendicular cliff composed of sand and gravel. The light is situated near the western extremity of the island.

Smith Island Light is shown from a white conical tower on dwelling. It is 96 feet above water and visible 16 miles. There is a radiobeacon at the light.

Minor Island, marked by a light, small, low, and rocky, lies 1 mile northeastward of Smith Island, and at lowest tides is connected with it by a gravel and boulder spit. An echo board is also maintained here. A field of kelp extends about 1.5 miles westward of Smith Island, with a width of 1 mile and depths of 4½ to 5 fathoms. A sunken rock, bare at lowest tides, is reported 0.4 mile 261° from the light.

Minor Island Light is shown from a small, square, white house, 16 feet above water. A fog signal is sounded on an air horn at the light.

Whidbey Island, northward of Admiralty Head, forms the eastern side of the Strait of Juan de Fuca. From Deception Pass, at the northern end, the shore of the island trends southward for 2 miles thence southwestward for 4 miles, consisting of a uniformly sandy shore backed by low and rolling upland, about evenly divided between farm and cut-over timber land, with few elevations over 100 feet.

STRAIT OF JUAN DE FUCA, SOUTHERN SHORE

(CHART 6300)

CAPE FLATTERY TO KLACHOPIS POINT

(CHART 6265)

Cape Flattery, the southern point at the entrance, is described on page 251.

From Cape Flattery, the coast trends east-northeastward for 4 miles to **Koitlah Point,** the western point at the entrance of Neah Bay. The shores are rugged, and the country is heavily timbered.

Neah Bay about 5 miles eastward of Cape Flattery, is used extensively by vessels as a harbor of refuge, when the weather is too severe to venture outside. Its proximity to the entrance to the strait and ease of access at all times makes this anchorage very

valuable. A rubblestone breakwater approximately 8,000 feet long, extends from the western side of the bay to about the middle of Waada Island. Anchorage is in depths varying from 4 to 6 fathoms, sandy bottom. **Waada Island,** about 0.5 mile long by 250 yards in width, forms the northeastern side of the bay; it lies 0.3 mile northward of Baada Point and is high and wooded, with a reef and foul ground extending 0.2 mile from its southwestern side. There is a wharf on the southwestern side of the island just southward of the foul ground. A lighted bell buoy is moored 0.5 mile 325° from Waada Island Light.

Waada Island Light* is shown from a concrete tower on the northern end of the island. The light is 63 feet above water, and visible 14 miles. A red sector from 98° to 107° covers Duntze and Duncan Rocks. A fog signal is sounded on an air diaphragm horn.

The western shore of Neah Bay is high, precipitous, and bordered by craggy outcropping rocks. A reef, bare at low tide, and marked by kelp, extends in places a distance of 0.2 mile from the beach. From the town, the character of the shore changes to a low, sand beach, which continues to Baada Point.

Between Waada Island and the mainland southeastward, is the entrance channel, having a depth of 20 feet or more, and a clear width of 300 yards between the 3-fathom curves. **Neah Bay Light** located on the southeastern end of Waada Island marks this channel. The light is 46 feet above water and visible 8 miles; it is obscured from 114° to 196°.

Baada Point, the southeastern entrance point of this channel, is rocky and grass-covered for some distance back from the shores. The buildings of the **Coast Guard station,** 0.4 mile southwestward of the point, are the prominent features on the point. A T-head pier, 470 feet long, is situated 500 feet eastward of the Coast Guard launching ways. There is a log dump pier about 0.2 mile eastward of the Coast Guard ways. A group of small white houses are located between the pier and the point.

A reef, bare at low tide, extends 500 yards northwestward from **Dtokoah Point,** the point 500 yards eastward of Baada Point. The end of the reef is marked by a buoy.

Neah Bay in the southwestern part of the bay, is a large Indian village with a post office and daily mail service. Fish and pulpwood are shipped by water.

There is a large wharf with 18 feet alongside in the center of the bay; close westward there is a small boat wharf with float, maintained during the summer months, with a depth of 6 feet at the float.

Customs.—There is a deputy collector of customs at Neah Bay.

Pilots and **towboats.**—The bay is frequently used as an anchorage for towboats waiting for a tow, and which may be obtained by making signal to Cape Flattery Light. The masters of the tugs are the only pilots available.

Supplies.—Fresh water, diesel oil, fuel oil, and gasoline can be obtained in limited quantities. Oil and water are piped to the large cannery wharf; a limited amount of provisions may be obtained.

Communication.—Telephone service may be had to both Port Angeles and Tatoosh Island via the Coast Guard lines. There is daily bus service to Port Angeles.

Directions.—To enter Neah Bay, pass 100 yards northwestward of the buoy marking the reef northwestward of Dtokoah Point and steer **244°** heading for the building on the outer end of the wharf. This course leads through mid-channel.

Dtokoah Point and **Klachopis Point** are 0.3 and 0.6 mile respectively eastward of Baada Point. Two bights, **First Beach** and **Second Beach,** separate the three points.

*Lat. 48°23′.2, Long. 124°35′.9: Charts 6300, 6102, 6265.

KLACHOPIS POINT TO TWIN RIVERS

(CHART 6300)

From Neah Bay to Clallam Bay, the coast trends eastward for about 14 miles. The shores are rugged and the country is high and heavily wooded.

Seal Rock and **Sail Rock,** 660 and 560 yards offshore, respectively, lie about 2 miles eastward from Neah Bay Light. Seal Rock, the western one, is 100 feet high, and has a flat top, sloping eastward; it is light in color. Sail Rock is 0.2 mile eastward of Seal Rock; it is lower and more pointed than Seal Rock. Both are prominent landmarks. A line of sunken rocks extends from Seal Rock to the point 1.2 miles 130° from it. There are patches of kelp between Seal Rock and the shore and along the line of sunken rocks. Kelp and some sunken rocks extend over 400 yards off a point 5 miles eastward from Seal Rock.

Logs are rafted in considerable quantities out of **Sail River,** near Seal and Sail Rocks, and **Sekiu River** about 6.5 miles eastward. The railroad trestle over Sekiu River shows prominently through the trees.

Hoko River enters the Strait at **Kydaka Point** about 11 miles eastward of Waada Island Light.

Clallam Bay, about 15 miles westward of Neah Bay, is a broad and open bight about 2 miles long and 1 mile wide. It affords anchorage in 9 to 10 fathoms, sandy bottom, and is used to some extent in southerly or thick weather.

Slip Point, the eastern point of the bight, is high and wooded; there is a light-colored streak, like a landslip, down its face, which is visible for a long distance. A reef extends about 0.2 mile westward of the point. A bell buoy is moored off the end of the reef.

Slip Point Light* is shown from a white square tower, with a dwelling attached, situated on a narrow shelf at the western extremity of the point. It is 48 feet above the water and visible 12 miles. A fog signal is sounded on an air diaphone.

Sekiu is a town on the western end of Clallam Bay and southward of Sekiu Point. There is telephone, truck and bus service with Port Angeles and Neah Bay. The logging company's tugs, tankers, and steamers call occasionally; there is no regular freight service by water. The logging wharf has a depth of 15 feet. Log rafts are made up here for shipment.

Clallam Bay is a town on the eastern side of Clallam Bay, with communication and freight service similar to that at Sekiu. A short privately owned pleasure pier has a depth of about 3 or 4 feet at the outer end. The ruins of a logging wharf are about 0.2 mile eastward of the pier. Kerosene, gasoline, and a limited amount of general merchandise may be had here.

No directions are necessary for entering other than to give Slip Point a berth of not less than 0.2 mile to avoid the reef projecting westward of it, which is marked by a bell buoy. Storm-bound vessels generally anchor abreast the rocky point near the middle of the long semicircular beach, on the southern shore of Clallam Bay.

From Slip Point, the coast trends eastward for 6.5 miles to Pillar Point and then east-northeastward for 15.5 miles to Crescent Bay.

Pillar Point is a bold point, 700 feet high, wooded to the summit, and with a dark pillar-shaped rock over 100 feet high, lying close under its eastern face. The rock shows prominently from westward.

Pysht River discharges into a small bight a mile southward of Pillar Point. The water shoals rather suddenly off the mouth of the river, but good anchorage may be had

*Lat. 48°15′.8, Long. 124°15′.0: Charts 6102, 6300.

in 9 to 12 fathoms, sticky bottom, about 0.8 mile southeastward of Pillar Point. This anchorage offers good shelter from the heavy westerly swell, but has no shelter from the brisk easterly and northeasterly winds, which prevail in the winter.

Pysht, located near the mouth of the Pysht River, is a village with a post office, and has telephone and bus connections. Log rafts are made up for shipment to sound ports.

TWIN RIVERS TO PORT ANGELES

(CHART 6382)

Twin Rivers, about 7 miles eastward of Pillar Point, is a small cove protected by shoal spits on either side of it, upon which the sea breaks in rough weather. This cove is about 600 feet wide and indents the shore about the same distance. Both spits are heavily covered with kelp, especially the eastern one. There are depths of 4 fathoms abreast the ends of the spits, and 2 fathoms can be carried close to shore. The cove is an excellent landing place, but offers little protection as an anchorage. Entry can be made between the spits by heading midway between the rivers, which are easily identified, on bearing 180°.

Twin is a small settlement. There are motor bus and rail connections with Port Angeles.

Gettysburg, a hamlet at the mouth of **Lyre River,** is 11.5 miles eastward of Pillar Point. Shoal water makes out a considerable distance from **Low Point,** the eastern entrance point of Lyre River, and vessels should not approach this point closer than 0.8 mile. There are many boulders, bare at low tide, westward of the point.

Agate Bay, about 3½ miles eastward of Gettysburg, is clear and deep; 10 fathoms can be carried close to shore.

Crescent Bay, 15 miles eastward of Pillar Point, is a small semicircualr bight 1 mile in diameter. The eastern part is shoal and near the western shore the remains of a wharf should be avoided. This is not a good landing place in northerly weather. The anchorage is of limited extent and suitable only for small vessels. The town of **Port Crescent** has been abandoned, and all buildings and the wharf, which extended from the western shore, have been destroyed by fire.

Crescent Rock, with a least depth of ¼ fathom, lies 0.4 mile northward of the western entrance point of Crescent Bay. It extends 0.4 mile in an easterly direction, with a narrow channel between it and the point. The channel, with a reported depth of 10 fathoms, is used by the small coasting steamers with local knowledge, but is not recommended for those without local knowledge. The rock is marked by a lighted bell buoy, moored about 50 yards northward of the shoalest part. A reef extends about 400 yards northwestward from **Tongue Point,** the eastern entrance point of Crescent Bay. A shoal, with a least depth of 1¼ fathoms, lies about 0.3 mile westward of Tongue Point.

Observatory Point* lies about 3 miles eastward of Tongue Point. Between them is a wooded ridge which, because of the lower land behind it, appears as an island when raised from eastward or westward. The ridge attains an elevation of 1,135 feet. On its north face is a conspicuous landslide, and the hill is known as **Striped Peak.** A rock, 20 feet high and having a single tree on its summit, lies close off Observatory Point; the rock and the point are almost joined at low water.

Freshwater Bay, about 5 miles eastward of Crescent Bay, is a broad, open bight, affording anchorage in 6 to 10 fathoms. It is little used, on account of the lack of shelter

*Lat. 48°09′.0, Long. 123°38′.3: Charts 6300, 6382.

and its proximity to Port Angeles. There is an old log dump in about the center of the bay, and at the mouth of **Covill Creek.** Shingles are shipped at times by rail or truck from the bay.

Angeles Point, on the eastern side of Freshwater Bay, is low, sandy, and covered with alders. The **Elwha River** empties into the strait at this point. Small boats can enter the mouth under favorable conditions.

PORT ANGELES

(CHART 6303)

Port Angeles is about 6.5 miles eastward of Freshwater Bay and 56 miles from Cape Flattery; the entrance is about 11 miles southeastward of Race Rocks Light and is included between **Ediz Hook,** a low, narrow, and bare sand spit, 3 miles long, and the main shore to the southward. The harbor is about 2.5 miles long with a width of 1.2 miles at the entrance, decreasing to half that width at the head. The harbor is easy of access by the largest vessels and is frequently used by them when weather-bound, awaiting orders, or a tug.

The harbor is protected from all but easterly winds, which are rare and have no serious effect. During southeasterly gales in winter, the wind is not usually felt but some swells roll into the harbor. The depths are greatest on the northern shore, and decrease from 30 to 15 fathoms in the middle of the harbor; from the middle, the depths decrease regularly to the southern shore, where the 3-fathom curve in some places in the eastern part is nearly 0.2 mile from the beach. The best anchorage is off the wharves, in 7 to 12 fathoms, sticky bottom.

Ediz Hook Light* is shown from a prominent white tower on a dwelling near the eastern extremity of Ediz Hook. The light is 47 feet above the water, and visible 12 miles. A fog signal is sounded on an air siren.

Port Angeles is situated on the southern shore, and is a port of entry; a deputy collector is stationed here. Lumber, logs, pulpwood, and wood pulp constitute the greater part of the traffic, although the port is becoming more important each year as a gateway for the receipt of canned goods, cement, petroleum products, and general merchandise, and for the shipment of fresh and canned fish, vegetable products, and general merchandise. There are three wharves for general cargo, one wharf for loading gravel, and one for fuel. The port of Port Angeles maintains a wharf, 147 by 552 feet, with a depth of 34 feet alongside, equipped with transit sheds and modern loading facilities. There is a large crane on the wharf which is used occasionally to lift out small fishing craft of 10–12 tons, for repairs. The saw-mills and forest-products companies have their own exporting wharves with depths ranging from 24 to 34 feet.

Shoal.—A least depth of 4 fathoms lies 233 yards 350° from the northwestern corner of the wharf projecting from the southern shore of the port, eastward of the town, near **Ennis Creek.** This shoal is marked by a buoy.

Pilots.—Pilots for Puget Sound and Alaska may be had at Port Angeles. They should preferably be engaged in advance, by communicating with the Puget Sound Pilots' Association, Seattle. The Pilot station is located on Ediz Hook at the Coast Guard Airport. A whistle of a long, a short, and a long blast is used to call a pilot. No mast for visual signals has been erected on account of proximity to the air field.

Towboats.—Small towboats are always available, and others can be obtained on short notice.

*Lat. 48°08′.5, Long. 123°24′.2: Charts 6300, 6382, 6303.

Quarantine.—All vessels entering Puget Sound destined for United States ports are boarded and inspected at Port Angeles except certain silk-and-passenger carrying vessels, which pass Port Angeles between 10 p.m. and sunrise and are permitted to proceed to Seattle for inspection. Vessels from foreign ports which expect to enter both Canadian and United States ports may receive their inspection either at William Head, Canada, or Port Angeles, no further inspection being required. Ships under quarantine anchor in the bay off the city wharves. Fumigation may be arranged at Port Angeles.

Immigration.—Port Angeles is a port of entry for aliens.

Marine Hospital.—The Public Health Service maintains a medical relief station and contract hospital at Port Angeles.

Yacht Harbor.—There is a harbor for small boats just westward of the port of Port Angeles Wharf. Protection is afforded by a pile jetty, 530 feet long.

Harbor regulations.—Complete copies of the Harbor regulations may be obtained from the harbor master of the city of Port Angeles.

Directions.—No directions are necessary. Vessels may round Ediz Hook at a distance of over 200 yards and proceed to the wharves or select anchorages as desired.

Supplies.—Water, provisions, and ship chandlers' stores may be obtained; coal is not kept on hand but can be arranged for. A limited amount of fuel oil may be had from the local mills, which have supplies for their own use. Gasoline, diesel oil, and lubricating oils for motor ships and small boats may be obtained at the oil wharf.

There is a **chart agency** of the U. S. Coast and Geodetic Survey situated here.

Repairs.—There are no drydocks at Port Angeles. There are 2 or 3 small marine railways, suitable for ordinary fishing craft. Minor repairs to hulls and machinery may be made at several machine shops and iron works in the city.

Communication may be had by rail with Port Townsend and with Puget Sound and British Columbia ports by regular steamer and telegraph. There are bus and airplane services to Seattle, and an automobile ferry to Victoria, British Columbia. A submarine cable crosses the Strait of Juan de Fuca from Port Angeles to Victoria. It is landed about 1 mile westward of Ediz Hook Light and vessels should not anchor near this cable.

The offices of the **Customs, Immigration,** and **Coast Guard Communications Office** are located in the Federal Building at First and Oak Streets.

The **Public Health Service Office** is in the 1st National Bank Building.

The Port of Port Angeles Commission Office is located at the Port Docks.

Port Series No. 27 covers Port Angeles.

Storm-warnings displays, day and night signals, are shown from a steel tower on Laurel Street, and are plainly visible to vessels in the harbor and strait.

PORT ANGELES TO SEQUIM BAY

(CHART 6382)

From Port Angeles, the coast trends east-northeastward for 5 miles to **Green Point,** and thence northeastward for 8 miles to the end of **Dungeness Spit.**

Dungeness Bay lies about 12 miles eastward of Port Angeles. It affords shelter in westerly winds, but is open eastward, and in northerly weather the protection afforded is only fair. It is a dangerous place in winter gales, especially from the southeast. The bay is formed by a sand spit extending northeastward 4 miles, and forming, in addition

to Dungeness Bay, a small lagoon at the head of the harbor, which can be entered by light-draft vessels with local knowledge.

New Dungeness Light* is shown from a prominent conical tower on a dwelling, upper part black, lower part white; situated near the end of the spit. The light is 67 feet above the water, and visible 14 miles. A fog signal is sounded on an air siren. A radiobeacon, equipped for distance finding, is maintained at the lighthouse.

From the end of the spit, a shoal extends northeastward for 0.8 mile from the lighthouse. This has been reported as extending farther northward and it should be passed with caution. A buoy marks the shoal; vessels should not pass between the buoy and the light. From the southern side of the bay a shoal makes out about a mile, and in the vicinity of the wharf this shore is bordered by mud flats.

The best anchorage is in 5 to 9 fathoms, sticky bottom, on line between the end of the long wharf and the lighthouse. A submarine power cable extends from Dungeness to New Dungeness Light station. It is marked by a cable crossing sign 153 yards westward of Dungeness Wharf, and another on the shore near the light station. Vessels should not anchor between these signs. Two buoys, near the cable, mark the edge of the shoal to the westward of the wharf.

Dungeness is a small town situated on the southern shore of the bay. Farm produce is the principal shipment; general merchandise and feed are received. There is a wharf about 4,000 feet long and 75 feet wide at its outer end, with a small warehouse and tank on it. A draft of 18 feet can be carried from the eastward to this wharf. There is a small lighthouse wharf on the southern side of the spit with a depth of 6 feet alongside. A limited amount of provisions may be obtained. Communication may be had with Puget Sound ports by steamer, telephone, and bus; the freight service to Dungeness by water is infrequent.

No directions are considered necessary further than to caution vessels not to pass between the light and the buoy marking the extremity of the shoal making off from the spit.

SEQUIM BAY TO MIDDLE POINT

(CHART 6403)

Sequim Bay (formerly **Washington Harbor**), is a landlocked bay, 3.8 miles long and 1 mile wide. From the eastern entrance point, a sand spit extends westward almost to the western shore and terminates in **Kiapot Point,** leaving only a narrow, winding channel, through which 11 feet can be taken at low water with local knowledge. Northward of this point, a shoal extends about 800 yards eastward from the western shore, and, southward of the point, a bar extends across the fairway. Once inside, there is good anchorage anywhere in 6 to 20 fathoms, muddy bottom. The harbor is but little used, and can be approached only by those with local knowledge. A cannery with conspicuous white buildings is located on the western side of the entrance to the harbor, abreast the sand spit. It has a wharf in front, about 100 feet long, with 17 feet of water alongside. This is the shipping point for the town of **Sequim.** Some farm produce is shipped, and feed is received in considerable quantities; logs are rafted out in small amounts. At the northwestern corner of the harbor is a shallow lagoon. **Sequim Bay State Park** is situated at the southwestern end of the bay.

*Lat. 48°10′.9, Long. 123°06′.6: Charts 6300, 6382.

Blyn, of little commercial importance, is situated in the southeastern part of the bay.

To enter Sequim Bay proceed close in along the sand spit about 100 yards or less from shore. When rounding Kiapot Point, pass to the western side of the channel and continue southward close to shore (not over 100 yards off) until past a rather prominent whitewashed rock, maintained locally as an aid. Then steer **150°**, clearing **Pitship Point** by 500 to 600 yards, into deep water. The least depth in this channel is 11 to 12 feet.

Protection Island, is a prominent feature in approaching Admiralty Bay. The island, 200 feet high near its western extremity, is 1.5 miles long and 0.5 mile wide; it is sparsely wooded and the northern shore consists of bare, light bluffs. The eastern end and southern shore are clear of dangers, but off **Kanem Point***, its southwestern extremity, a shoal extends southwestward for over 0.2 mile, and depths of 5 fathoms and less are found 0.5 mile westward of the point. This shoal is marked by a buoy about 0.8 mile west-southwestward of Kanem Point. **Dallas Bank** extends northward from Protection Island; the 10-fathom curve lies about 2.5 miles from the northern point. Northward of the 10-fathom curve the bank drops off abruptly to depths of over 20 fathoms.

Port Discovery, where Vancouver anchored and refitted his ships and from whence he commenced his exploration of these regions in 1792, lies about 2 miles south-southeastward of Protection Island. The bay trends in a southeasterly direction for about 8 miles and has an average width of 1.2 miles. The entrance is masked from seaward by Protection Island, which also protects it from northwesterly winds. There are no outlying dangers, and the depths in mid-channel range from 30 fathoms at the entrance, to 10 and 12 fathoms, 1.5 miles from the head; good anchorage may be had in 8 to 10 fathoms, muddy bottom. The flats rise abruptly from depths of 3 and 4 fathoms, and at high water care should be taken to avoid anchoring too close to them. This harbor is but little used, as it is out of the usual lines of travel.

A submarine cable crosses the inlet at **Carr Point,** on the western shore about 3.2 miles southeastward of Diamond Point.

Diamond Point (formerly **Clallam Point**) the western point at the entrance to Port Discovery, is the site of the former national quarantine station. The station is now in private ownership; the building and wharf still remain.

Gardiner, 2 miles southward of the former national quarantine station has occasional freight service. This service and the rafting out of log booms comprise the present commercial activities at Port Discovery.

No directions are considered necessary for entering, and a mid-channel course is clear to the anchorage. Entrance may be made either eastward or westward of Protection Island.

The shore from **Cape George,** the eastern entrance point of Port Discovery, to Middle Point, a distance of about 3 miles, consists of high, bare, clay bluffs, sparsely wooded on top, attaining a height of 400 feet near **Middle Point.**

A shoal with 2 fathoms over it, lies 0.6 mile northwestward of Middle Point; it is marked by a buoy. A sunken rock has been found southward and eastward of the shoal, and vessels are cautioned not to pass between the buoy and the point.

*Lat. 48°07′.2, Long. 122°56′.9: Charts 6300, 6382, 6403, 6450.

MIDDLE POINT TO WHIDBEY ISLAND

(CHART 6450)

From Middle Point, the shore trends northeastward for 3.5 miles to Point Wilson, the western point at the entrance to Admiralty Inlet, and consists of high, bare, clay bluffs, sparsely wooded on top, decreasing in height near Middle Point, and ending abruptly close westward of Point Wilson.

Point Wilson is a low point and is marked by a light. **Point Wilson Light,** shown from a white octagonal tower on fog signal building, is located on the eastern extremity of the point. The light is 50 feet above water, and visible 12 miles. The fog signal is sounded on a horn. The former siren was reported to be difficult to hear from certain directions. There is a radiobeacon, equipped for distance finding, maintained at the lighthouse.

Shoals extend 0.5 mile northwestward of Point Wilson to the 5-fathom curve, over irregular bottom; these are generally indicated by kelp. The eastern edge of the shoals rises rather abruptly from deep water. Heavy tide rips extend northward of these shoals, being especially heavy with a westerly wind and ebb current. A buoy is moored northward of these shoals about 0.7 mile northwestward of Point Wilson Light. The area in the vicinity of the buoy was examined by the wire drag in 1925 and no obstructions other than charted, were found.

In approaching Point Wilson in thick or foggy weather, especially if the fog signal is not heard, vessels should obtain soundings constantly.

Admiralty Inlet is described on page 317.

The western shore of Whidbey Island, between Admiralty Head and Point Partridge, is mostly a sandy beach rising sharply to bluffs 100 to 250 feet high, backed by pine trees. The shoreline is generally heavily strewn with logs.

Admiralty Head, 80 feet high, on Whidbey Island, the eastern entrance point of Admiralty Inlet, is the southeastern extremity of a succession of light bare bluffs which extend well northward of Point Partridge, where they attain their highest elevation. About 0.5 mile northward of Admiralty Head, an abandoned tower stands on top of a bluff.

Point Partridge, the westernmost point of Whidbey Island, has a yellow face and is prominent from the northward or southward; being rounding, is not easily identified from the westward. **Point Partridge Light,*** unwatched, is shown from a white house on piles, off the extremity of the point. The light is 30 feet above water and visible 11 miles. A fog signal is sounded on an air diaphragm horn.

A rocky ledge extends 0.5 mile westward from the point, and in summer is usually marked by kelp. A lighted bell buoy is moored close westward of the ledge. Vessels should not pass eastward of this buoy.

From Point Partridge, the northwestern coast of Whidbey Island extends north-northeastward 11.5 miles to Deception Pass. It is free of off-lying dangers, but should not be approached within about 0.8 mile.

Eastern Bank lies about 4.5 miles west-southwestward of Smith Island (see page 264). The general depths on the bank are from 11 to 19 fathoms, and the least depth of 10 fathoms, sand and gravel bottom, is located 4.4 miles 258° from Smith Island Light.

Partridge Bank, within the 10-fathom curve, is about 3 miles long, 1.5 miles wide, and the southeastern extremity reaches within 2 miles of Point Partridge. The northern

*Lat. 48°13′.5, Long. 122°46′.3: Charts 6300, 6450.

and eastern sides fall off abruptly to 20 and 30 fathoms. The shoalest part has a depth of 2¼ fathoms and lies near the northern side about midway between the southeastern and northwestern ends of the bank; it is marked, close northward, by a buoy. A lighted bell buoy is moored about 0.6 mile south-southeastward of the 2¼ fathom spot. Depths of 4 and 5 fathoms extend 1 mile west-northwestward of the 2¼-fathom patch. A considerable part of the bank is covered with kelp, which is usually drawn under by currents. The kelp generally extends to the 7-fathom curve, except toward the eastern end, where the shoal narrows, and no kelp exists beyond a depth of 4 fathoms.

SAN JUAN ARCHIPELAGO

(CHART 6380)

The waters of **San Juan Archipelago** embrace the passages and bays northward of the eastern end of the Strait of Juan de Fuca. These passages are used extensively by vessels bound for British Columbia and Alaska ports, and by local steamers.

The directions which follow are intended for use only in clear weather; in thick weather or at night, strangers should take a pilot. Sailing vessels should not attempt the passages against the current unless the wind is fair and fresh. The tidal currents have great velocity in places, causing heavy tide rips, that are dangerous for boats. Owing to the variable direction and velocity of the currents, compass courses are of little value, and where followed allowance must be made for the set of the currents.

HARO STRAIT

(CHART 6380)

Haro Strait, the westernmost of the three main channels leading from the eastern end of the Strait of Juan de Fuca to the southeastern end of Georgia Strait, is the one most generally used. Vessels bound from the westward to parts in Alaska or British Columbia should use Haro Strait, as it is the widest and best provided with aids to navigation. Vessels bound northward from Puget Sound may use Haro Strait, San Juan Channel, or Rasario Strait.

From between Discovery Island and the southern part of San Juan Island, Haro Strait extends northward for about 16 miles to Turn Point Light on the western end of Stuart Island, and then bends sharply northeastward for 11 miles to its junction with Georgia Strait, between East Point, the eastern end of Saturna Island, Canada, and Patos Island, both of which are marked by lights. The width varies from 2 to 6 miles, and the depths are generally great.

No difficulty will be experienced in navigating the strait in clear weather; in thick weather strangers should have a pilot.

The eastern shore of the strait will be described in detail, followed by a more general description of the western shore. For a more complete detail of the western shore see *Sailing Directions for British Columbia, Volume I,* published by the United States Hydrographic Office.

Caution.—The International Boundary between United States and Canada passes through Haro Strait. The position of the boundary is shown on the charts by a dotted line. The International Pilot Rules are used in Canadian waters and in Georgia Strait; the Inland Pilot Rules are in effect in United States waters south of Georgia Strait.

Tidal Currents.—In Haro Strait the flood current sets northward through the strait,

and the ebb in the opposite direction. On the average the ebb runs longer and has a greater velocity than the flood. At its northern entrance, the flood sets eastward on both sides of Sucia Islands, and eastward across Alden Bank. The velocity of the current in the strait is 2 to 5 knots, increasing to between 3 and 6 knots between Stuart Island and Gooch Island, at East Point, and between Patos Island and Sucia Islands. The current has moderate velocity between Sucia Islands and Orcas Island. There is a large daily inequality in the current, and for times and velocities the *Current Tables, Pacific Coast* should be consulted. Heavy tide rips occur on Middle Bank and northward of it and around Discovery Island. Tide rips also occur between Henry Island and Turn Point on the ebb, and around Turn Point. Heavy dangerous tide rips occur between East Point and Patos Island and for 2 miles northward, in Georgia Strait. The flood current sets eastward from Discovery Island across the southern end of Haro Strait until close to San Juan Island. This eastward set is especially noticeable during the first half of the flood.

Middle Bank, which is rocky and has a least depth of 9 fathoms, lies in the southern approach to Haro Strait. The bank is about 3.5 miles in extent and the least depth is located near the northeastern extremity of the bank and about 5.5 miles eastward of Discovery Island Light. In the vicinity of this bank heavy tide rips, which are dangerous to boats and small craft, are formed in bad weather.

Two small banks with depths of 7 and 8 fathoms lie, respectively, about 3.2 miles 31° and 2.5 miles 45° from Discovery Island Light. In bad weather, heavy tide rips are formed over both of these banks, A small detached bank with a depth of 8 fathoms lies 4 miles 71° from Discovery Island Light.

San Juan Island, the largest of the group, is about 13 miles long, with a greatest width of 6 miles. The island is rugged and partly wooded. **Mount Dallas,** the highest of several hills on the island, rises abruptly from the middle of the western side to a height of 1,036 feet. In most places the shores are free of outlying dangers. The northern end of the island is indented by several small bays which, with the exception of Roche Harbor, are shoal and of no commercial importance.

From **Eagle Point,** the western shore of San Juan Island trends northwestward and forms the eastern side of the southern part of Haro Strait. This shore is steep-to and rocky, and beyond 400 yards offshore, it is free of danger; however, the depths off this shore are too great for anchoring.

False Bay, 5 miles westward of Cattle Point, the southeastern extremity of the island described on page 283, dries at low water and has a line of rocks across its entrance.

Kanaka Bay, a small cove much used by fishing boats, lies between False Bay and **Pile Point.**

Lime Kiln Light* is shown from a white octagonal tower attached to a fog-signal building; two dwellings are about 150 yards southeastward. The light is 55 feet above water, and visible 13 miles. The fog signal is sounded on a reed horn. A small wharf at the lime kiln in the small bay just northward of this light has a least depth of 12 feet along its northern end.

Rocks, awash at mean lower low water, lie close inshore about 1 mile 148° from the light.

Andrews Bay is a small indentation about 2 miles northward of Lime Kiln Light. A submarine cable crosses Haro Strait from Andrews Bay to Telegraph Avenue, Vancouver Island.

*Lat. 48°31.0, Long. 123°09.1: Charts 6300, 6380.

Hanbury Point lies about 1.8 miles northward of Andrews Bay. It is the northern entrance point of **Mitchell Bay,** in which the charted depths are less than 2 fathoms.

Mosquito Pass, which is available only to vessels of light draft and with local knowledge, is entered westward of Hanbury Point. About 0.7 miles northward of Hanbury Point, a channel leads northeastward of Mosquito Pass to **Westcott Bay,** in the southern part of which is **Garrison Bay.** These bays are available only to small craft with local knowledge.

Henry Island lies close westward of the northern point of San Juan Island, from which it is separated by Mosquito Pass and Roche Harbor.

Kellett Bluff, at the southern end of Henry Island, is steep and rocky, and prominent from either southward or northward. A light, 80 feet above water and visible 7 miles, is shown from a small white building on the western side of Kellett Bluff.

Roche Harbor (Chart 6381) has its main entrance on the eastern side of the northern end of Henry Island, between it and **Pearl Island.** The harbor, which is landlocked, is about 0.5 mile in extent and has depths of 5 to 8 fathoms. It affords good anchorage and in the summer season is used extensively by yachts. Regular communication by mail launches and highways is maintained with neighboring ports; there are telephone connections. Gasoline and a small amount of provisions may be obtained. Water can be had at the wharves. The depth at the outer end of the main wharf is 13 feet. Lime is the principal product, but a barrel factory and a yacht club are also located here. There is a repair yard with ways that can handle any of the local craft.

Battleship Island, small, 30 feet high, with 2 trees on it, lies about 0.2 mile west-northwestward of **McCracken Point,** the northern extremity of Henry Island, and is the western point in the approaches to Roche Harbor.

Danger Shoal, with a least depth of 1 fathom, lies in the fairway to Spieden Channel about midway between Battleship Island and Spieden Bluff. An obstruction buoy is moored close southwestward of the shoal, which is marked by kelp at slack water.

A rock, marked by kelp, with 2 fathoms over it, lies about 200 yards northwestward of **Barren Island;** it is marked by a buoy moored close northwestward of the rock. Another rock, marked by kelp, with 1 fathom over it, lies about 350 yards eastward of the one marked by the buoy.

The main entrance to Roche Harbor lies between the northeastern extremity of Henry Island and the western extremity of **Pearl Island,** about 400 yards southeastward. From either entrance point, spits with depths of 16 to 17 feet, extend into this entrance channel, which, therefore, should not be attempted by vessels of deep draft.

Directions.—To enter Roche Harbor from westward, pass 0.2 to 0.5 mile northward of Battleship Island on a **115°** course until the middle of the entrance bears 199°. Stand in on this bearing, keeping the entrance points of **Nelson Bay,** at the head of the harbor, just open, so as to see across the low neck of land at its head. Steer nothing eastward of midchannel in rounding the southwestern point of Pearl Island. Anchor in 5 to 7 fathoms, soft bottom.

From eastward, steer so as to pass 250 yards northward of Roche Harbor buoy, marking the 2 fathom rock, northward of Barren Island; and, when up with this buoy, head for Battleship Island until the middle of the entrance bears 199°, and thence proceed as directed in the preceeding paragraph.

Spieden Channel leads eastward between Spieden Island on the north and Battleship, Henry, and San Juan Islands, on the South; the channel leads from Haro Strait to President Channel and San Juan Channel. The eastern entrance, the narrowest part, is 0.6 mile wide, and for 2 miles westward of it, the channel is free of danger.

However, in the western entrance, which has an irregular bottom, there are several dangers, but the fairway is deep throughout. The meeting of the flood currents, which flow eastward from Haro Strait and westward from San Juan Channel, causes heavy tide rips and eddies. This channel is not recommended for sailing vessels.

Spieden Island (Chart 6381) lies with **Spieden Bluff,** its northwestern extremity, about 1.5 miles north-northeastward of Battleship Island. The island is 2.5 miles long in an easterly direction with an extreme width of 0.5 mile. The eastern end is low and grassy; there are a few trees on the southern side of the island, but the northern face is well wooded.

Sentinel Island, steep, wooded, and of small extent, lies about 300 yards off the southern shore of Spieden Island and near its western end. **Sentinel Rock,** low and bare, lies about 400 yards westward of Sentinel Island; a sunken rock, marked by kelp, with ½ fathom over it, lies about midway between them. **Center Reef,** marked by kelp and bare at low water, lies nearly 0.4 mile 210° from Sentinel Rock.

Stuart Island, westward of Spieden Island, is wooded and has two rather prominent hills, 640 feet high, near the middle of it. **Turn Point** is the western extremity, which is bold and steep-to.

Turn Point Light,* on a white concrete tower, is 44 feet above the water and visible 12 miles; the light is obscured from 260½° to 357°. A fog signal is sounded on a reed horn.

Reid Harbor indents the southeastern shore of Stuart Island and trends northwestward about 1.5 miles. The harbor, which is landlocked and 400 yards wide, affords good anchorage in depths of 4 to 4½ fathoms, soft bottom. The harbor is free of danger, but from the eastern entrance point, foul ground is charted as extending about halfway across the entrance. Enter in midchannel and anchor anywhere in the middle of the wider portion of the harbor.

Prevost Harbor, on the northern shore, about 1.5 miles eastward of Turn Point, affords good shelter and anchorage. The village of **Prevost,** with 7 feet at the wharf, is situated on the western shore; it has a post office.

Satellite Island lies between the two entrance points, with reefs and shoals extending off the southeastern extremity. Vessels should not pass eastward of Satellite Island. Enter in midchannel westward of Satellite Island and anchor in 6 to 7 fathoms, muddy bottom, in the middle of the wider portion just within the entrance, keeping clear of a rock that bares about 8 feet, about 200 yards off the southern shore.

Johns Island lies close eastward of Stuart Island and is separated from it by **Johns Pass,** which should not be attempted without local knowledge.

Ripple Island, Cactus Island and a number of small islets and rocks lie southward and eastward of the eastern point of Johns Island, and between it and Spieden Island.

Waldron Island, steep and rocky on the eastern side, but flat with sandy beaches on the western side, lies about 6.5 miles eastward of Turn Point. It is irregular in shape 3 miles in length, with an extreme width of 2 miles. The highest point, 580 feet, is near **Point Disney,** its southern extremity. On the northern and eastern sides of the island there is a high, yellow sand bluff, terminating abruptly in **Point Hammond.**

Cowlitz Bay, which indents the southwestern shore of Waldron Island, is a broad, open bight affording anchorage in fair weather. Shoal water extends about 0.5 mile southward of **Sandy Point,** the western extremity of the island. **Mouatt Reef,** which has a least depth of 1¾ fathoms and is marked by kelp, lies 600 yards offshore and 0.5 mile northward of Point Disney. The village of **Waldron,** with a wharf built out to 7

*Lat. 48°41′3, Long. 123°14′2: Charts 6300, 6380.

feet, is situated on the shore northeastward of Mouatt Reef. There is a post office and a small general store there.

San Juan Channel is described on page 283.

Bare Island, small, grassy, and bare of trees, lies about 0.5 mile northwestward of Point Hammond, and **Skipjack Island,** 120 feet high and wooded, lies about 1.2 miles westward. The passages between them should be avoided on account of the velocity of the currents in their vicinity. A small, bare rock lies off the eastern end of Skipjack Island, and another, awash, lies about midway between it and Bare Island. A rock with ½ fathom over it lies about 0.5 mile northeastward of Point Hammond; it is usually marked by kelp.

Patos Island is about 4 miles north-northeastward of Point Hammond. The island is about 60 feet high and is wooded except at its western end toward which it gradually decreases in height. **Patos Island Light** is shown from a white square frame tower on fog-signal house situated on **Alden Point,** the western extremity of the island. The light is 52 feet above water, and visible 13 miles. The fog signal is sounded on an air diaphone. There is a radio beacon equipped for distance finding, maintained at the light.

Sucia Islands, a group consisting of one large and several smaller islands, lie southeastward of Patos Island. The large island, 60 to 160 feet high and heavily wooded, is horseshoe-shaped; its western side is a series of steep, wooded cliffs. **Echo Bay** indents the eastern side of the island between **Johnson Point,** the southeastern extremity of the island, and **Ewing Island,** about a mile north-northeastward. In westerly weather small vessels with local knowledge can find good anchorage in depths of 4 to 5 fathoms, near the head of the bay. **Fossil Bay** on the southern side of Sucia Isalnds, is used as an anchorage by pleasure craft during the summer season.

West Bank, about 1.5 miles southward of Patos Island, is about 1 mile in extent within the 10 fathom curve. The least depth of 1¾ fathoms lies 1 mile 261° from the western extremity of the westernmost of the Sucia Islands. Depths of 3½ and 3¾ fathoms lie within 0.5 mile eastward and southeastward of the shoalest spot. The channel between the bank and Sucia Island is not recommended.

Clements Reef, about 0.5 mile northward of Sucia Island, is about 1.2 miles long and 0.3 wide. It is marked by a buoy at its northern end. The channel between this reef and Sucia Island should not be attempted without local knowledge.

Boundary Pass, the channel between Patos and Saturna Island, is the widest and at present the most used passage from Haro Strait to Georgia Strait; at times, however, the passage between Patos and Sucia Islands is preferable, especially for vessels from San Juan Channel, see page 283, or for sailing vessels with a northwesterly wind.

The **tidal currents** are particularly heavy and dangerous between Patos Island and East Point and for 2 miles northward in Georgia Strait. Also see page 273.

The passage between Patos Island and Sucia Island is almost free of tide rips, and the tidal currents set more fairly through it and are less strong and more regular than in Boundary Pass.

Haro Strait, southwestern approach.—The various channels and passages leading between the islands and dangers off the coast from Gonzales Point to **Cadboro Point,** 2.8 miles north-northeastward, constitute the southwestern approach to Haro Strait. These passages and channels should be used only by vessels with local knowledge.

Baynes Channel leads to the southern end of Haro Strait from the northern ends of **Mayor Channel** and **Hecate** and **Plumper Passages.**

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Discovery Island is described on page 263.

Chatham Islands, northward of Discovery Island, and separated from it by a narrow boat channel, are low, wooded, and almost joined at low water.

Oak Bay, southward of Cattle Point, except during southeasterly gales, affords fair anchorage to small craft with local knowledge.

Cadboro Bay indents the shore of Vancouver Island between Cattle Point and Cadboro Point. The bay is open to the southeastward, but is not subject to heavy seas, and vessels with local knowledge may obtain good anchorage in depths of 4½ fathoms near the entrance to the bay.

Haro Strait, western side.—Discovery Island and Chatham Islands lie on the western side of the southern end of Haro Strait. Farther northward on the western side are the eastern coast of Vancouver Island and several islands and dangers.

Johnstone Reef lies about 1.5 miles northward of Cadboro Point at about 1,400 yards offshore. The shoal is marked by a buoy moored about 300 yards north-northeastward of the 1¾ fathoms spot.

Zero Rock lies about 1.8 miles north-northeastward of **Gordon Head.** The rock is of small extent and bares 10 feet. It is marked by a beacon—a pole surmounted by a triangular topmark, 25 feet high.

Little D'Arcy Island, 120 feet high, is the largest of several rocks and islets lying within 700 yards of the eastern and northeastern sides of **D'Arcy Island.**

Unit Rocks, of which the southernmost and highest dries 6 feet, lie about 0.5 mile southeastward of the southern point of Little D'Arcy Island. Foul ground lies between these rocks and D'Arcy Island and also extends almost 800 yards northeastward from the rocks.

Kelp Reefs, on the western side but near the middle of Haro Strait, lie about 2.2 miles northeastward of Zero Rock and about 7 miles northward of Discovery Island. The southernmost reef is awash; foul ground lies between Kelp Reefs and D'Arcy Island. **Kelp Reefs Light*** is shown from a black, cylindrical tank on a conical stone base, surmounted by a pyramidal steel frame. The light is 32 feet above water, and is visible 10 miles.

Sidney Channel leads between **James Island** and Zero Rock on the west, and **Sidney Island,** D'Arcy Island and Kelp Reefs on the east. It is a good, deep, naviagble channel and is about 0.8 mile wide in its narrowest part.

D'Arcy Shoals with a least depth of 2¾ fathoms lie in the fairway about 0.8 mile westward of the western extremity of D'Arcy Island. A buoy is moored on the southeastern edge of the shoal.

Hughes Passage, about 600 yards wide, leads between the rocks northward of D'Arcy Island and **Sallas Rocks.**

Halibut Island, 100 feet high, is small and wooded, and lies about 1 mile northward of the eastern extremity of Sidney Island. A detached shoal with a depth of 2¾ fathoms lies 900 yards southeastward of the southeastern end of Halibut Island.

Mandarte Island, 95 feet high, lies about 1,400 yards northwestward ofHalibut Island. Except for a few low trees on its northwestern end, this island is bare. A rocky ridge, drying 12 feet on its highest part, lies about 0.5 mile southeastward of Mandarte Island and extends about 400 yards southeastward.

Gooch Island, wooded and 240 feet high to the tops of the trees, lies about 1.5 miles

*Lat. 48°32′.9, Long. 123°14′.1: Charts 6300, 6380.

northward of Mandarte Island. **Tom Point** is the eastern extremity of a small islet, 145 feet high, which lies close eastward of the eastern end of Gooch Island. About 200 yards eastward of Tom Point is a rock that dries 1 foot and another with a depth of less than 6 feet.

Cooper Reef dries 7 feet and lies about 0.5 mile northward of Tom Point. A rock with a depth of 1 foot lies about 400 yards westward of the reef, and between the two the depth is less than 5 fathoms.

Arachne Reef lies 1.5 miles 336° from Tom Point, and consists of three small drying heads, the highest of which dries 5 feet. A 6-fathom patch lies about 0.5 mile northeastward of the reef.

Moresby Island lies on the western side of Haro Strait, at its northern end. The island is thickly wooded except for a large clearing on its northwestern side; near the middle of its southern side, there is a fairly conspicuous hill that attains a height of 575 feet to the tops of the trees. **Fairfax Point** is the southern extremity of Moresby Island. A rock, 14 feet high, lies close off Fairfax Point. **Pelorus Point** about a mile north-northeastward of Fairfax Point is the eastern extremity of the island.

Swanson Channel is described on page 280.

Wallace Point, the southeastern extremity of **North Pender Island,** lies about 3 miles northward of Turn Point.

South Pender Island, close eastward of the southern end of North Pender Island, is rocky and mountainous, but to a large extent is wooded. Near the western extremity of South Pender Island is **Mount Norman,** whose summit, attains a height of 890 feet to the tops of the trees, and near its southern side is **Curtis Peak,** which attains an elevation of 645 feet.

Bedwell Harbor, formed between North and South Pender Islands, with an average width of 600 to 800 yards, extends about 2 miles northwestward from between Wallace and Tilly Points. The harbor affords anchorage protected from the southerly winds, that sometimes blow with great force. Sunken rocks lie close off **Tilly Point,** the southern extremity of South Pender Island, and off the southern shore between Tilly Point and **Gowlland Point,** about 0.8 mile eastward.

Blunden Island, grassy and 64 feet high, lies close off the eastern extremity of South Pender Island. The narrow passage between these islands is foul, and foul ground extends about 0.2 mile eastward from Blunden Island. Because of tide rips, Blunden Island should be given a berth of at least 0.5 mile.

Saturna Island, on the western side of Boundary Pass, is the highest island in this vicinity, reaching a height of 1,425 feet near the middle of its southern side. **Taylor Point,** the southeastern point of Saturna Island, lies nearly 2 miles northeastward of Blunden Island. **Java Islets,** with heights of 10 to 16 feet, lie about 600 yards off the shore, midway between Taylor Point and Monarch Head, about 1.5 miles eastward. **Monarch Head,** about 800 feet high, is bold and rocky, and faced with cliffs almost 400 feet high. The coast between Monarch Head and Taylor Point consists of steep, rocky cliffs. **East Point,** 3 miles 263° from Patos Island Light forms the eastern extremity of Saturna Island.

Saturna Island Light* is shown from a white square wooden tower, attached to a dwelling on the extremity of East Point. The light is 125 feet above water, and visible 17 miles. The light is obscured between 63° and 144½° and should not be approached

*Lat. 48°47′.0, Long. 123°02′.6: Charts 6300, 6380.

from the northward or westward within 1.5 miles. The fog signal is an air diaphone, sounded from a square wooden building close northward of the light.

Boiling Reef, about 1 foot high on its outer part, extends about 800 yards north-northeastward from East Point, and it should be given a wide berth.

Rosenfelt Rock, on the western side of Boundary Pass, lies about 0.8 miles northeastward of **Tumbo Point,** the eastern extremity of Tumbo Island. It has a depth of 1 fathom over it and is generally marked by kelp; depths of 5 fathoms lie about 800 yards southeastward and 400 yards south-southeastward of the rock. A buoy is moored about 400 yards eastward of Rosenfelt Rock, and it should be given a wide berth. Close eastward of the rock, overfalls and dangerous tide rips are formed.

Plumper Sound is entered from Haro Strait between Blunden Island and Taylor Point, and extends northwestward between Saturna Island on the northeast and North Pender and South Pender Islands on the southwest. Plumper Sound offers no difficulties to navigation, for the few dangers lie close to the shore and are easily avoided; moreover, the velocity of the tidal current in the fairway does not exceed 2 knots, and most of the rocky shoal patches are marked by kelp in summer and fall. It is recommended as an anchorage because it is safe, convenient, and easy of access. For the first 2 miles inside the entrance, the depths are too great for anchoring except within 0.2 mile of the southern shore where there are depths of 10 to 12 fathoms. Beyond the first 2 miles inside the entrance, the depths decrease rather suddenly to 10 fathoms, and excellent anchorage may be obtained. The most convenient position is in a depth of 8 fathoms off the entrance to **Port Browning,** an arm entering between the western end of South Pender Island and **Razor Point,** on North Pender Island, at about 0.5 mile offshore. However, the cable area from Port Browning to a point close southward of **Elliot Bluff** on Saturna Island, should be given sufficient clearance.

Narvaez Bay lies between Monarch Head and East Point. The bay is open eastward, and with easterly winds a heavy swell rolls in; consequently, except in fine weather, the bay is not recommended as an anchorage.

Tumbo Island lies about 700 yards northward of the eastern end of Saturna Island and is separated from it by **Tumbo Channel.** This channel, though deep, is useless for general navigation, being obstructed at either end by many dangers. Tumbo Island is wooded and reaches a height of 285 feet to the tops of the trees; steep cliffs, 20 to 50 feet high extend along the whole of its southern side. **Tumbo Reef,** on which are several rocks with depths less than 6 feet, extends almost a mile east-northeastward from the eastern side of the island.

SWANSON CHANNEL

(CHART 6380)

Swanson Channel, the southern part of which lies between Moresby Island, see page 279, and North Pender Island, see page 279, leads westward from Haro Strait, connects Trincomali Channel and Active Pass, and thus leads to Georgia Strait, see page 303. Vessels bound for Alaska use Swanson Channel and Active Pass as an alternate route.

Parkin Point forms the northeastern extremity of Moresby Island and lies 1.3 miles northwestward of Pelorus Point, described on page 279. Depths of less than 5 fathoms lie within 250 yards of the northern side of Moresby Island, between Parkin Point and Reynard Point.

Canoe Rock lies on the southwestern side of Swanson Channel at about 800 yards west-northwestward of **Reynard Point,** the northwestern extremity of Moresby Island.

There is foul ground between the rock and the point. **Canoe Rock Light** is shown from a red cylindrical beacon on a grey hexagonal concrete base surmounted by a red pyramidal steel frame. The light is 25 feet above the water, and visible 10 miles.

Mouat Point, on North Pender Island, is fairly steep-to and lies about 4.5 miles northwestward of Wallace Point described on page 279. Between Wallace and Mouat Points, the southwestern shore of the island is bold and steep-to, and is composed of cliffs that on the southern part are 300 to 400 feet high, but near Mouat Point, are only 30 to 40 feet high. There are rocks awash, about 300 yards off the shore, along the coast southeastward of Mouat Point.

Portland Island, about 1 mile westward of Moresby Island, is wooded and near its southwestern side reaches a height of 287 feet to the tops of the trees. **Moresby Passage** enters Swanson Channel between Portland and Moresby Islands. **Chads Island,** 149 feet high, lies close westward of the northern extremity of Portland Island, with rocks and shoal water between the two islands.

Chesil Bank, with a least depth of 5½ fathoms, lies about 800 yards northward of the northern point of Portland Island.

Saltspring Island, on the western side of Swanson Channel, is the largest and most important of the Gulf Islands. The southern part of the island is wooded and mountainous, but the hills in the northern part are not more than 1,000 feet high. **Mount Bruce,** 2,330 feet high, is the summit of the island and lies about 3.2 miles northward of its southern extremity; from a distance, Mount Bruce can be identified by its flat summit.

Beaver Point, the eastern extremity of Saltspring Island, lies on the western side of Swanson Channel opposite Mouat Point, and about 2.2 miles northward of Portland Island.

James Point, on the eastern side of Swanson Channel, lies about 1.8 miles northward of Mouat Point. Good temporary anchorage may be had in 8 fathoms in **Otter Bay** which is on the southern side of James Point; however, the head and southern side of this bay are foul. A rock, 75 feet high, lies close southward of James Point, and another rock, 14 feet high, lies about 0.2 mile northeastward of the point.

Stanley Point, the northwestern point of North Pender Island, lies 0.7 mile northward of James Point, and between these two points, the shore is indented by **Port Washington,** a small cove, which is visited regularly by coastal steamers. Stanley Point and the shore for 0.2 mile northeastward of it are foul for a distance of about 100 yards offshore.

Prevost Island, thickly wooded and 434 feet high near its southeastern side, lies on the western side of Swanson Channel; **Liddell Point,** the southern extremity of the island, lies about 2 miles northward of Beaver Point. A reef, which dries 3 feet at its outer extremity, extends about 400 yards southeastward from Liddell Point. A buoy is moored close off the outer end of the reef.

Portlock Point, the northeastern extremity of Prevost Island, lies about 1.3 miles northward of Liddell Point. The shore of the island, for a distance of 0.5 mile south of the point, is fronted by a shoal. **Portlock Point Light*** is shown on the northeastern extremity of Prevost Island, from a white square wooden tower with a red lantern. The light is 72 feet above water, and is visible 10 miles. The fog signal is a bell sounded from a small white wooden tower 300 yards southeastward of the light.

*Lat. 48°49′.7, Long. 123°21′.1: Charts 6300, 6380.

ACTIVE PASS

(CHART 6380)

Active Pass leads northward from Swanson Channel to Georgia Strait; it lies between Galiano Island and Mayne Island. The pass is deep but tortuous, and in its narrowest part is about 600 yards wide. The dangers do not extend over 200 yards from shore.

Vessels should enter Active Pass at slack water if possible, but a vessel with a speed of 10 knots can always get through. A vessel with local knowledge can take advantage of the eddies and variations of the tidal currents, but others should keep in mid-channel. Active Pass is not suitable for sailing vessels due to strong tidal currents and the absence of steady winds.

Caution.—At all times great care should be taken in order to avoid the shoals on either side of the northern entrance of Active Pass.

Enterprise Reef lies in the southern approach to Active Pass at about 1,800 yards northward of Portlock Point Light. The reef consists of two rocky heads with depths of less than 6 feet and lying about 400 yards apart; foul ground extends between the heads and 200 yards westward of the western head. **Enterprise Reef Light** is shown on the western head of the reef from a concrete beacon, surmounted by a daymark carrying a white ball and lantern. The light is 15 feet above water, and visible 9 miles. The red sector of Portlock Point Light, bearing between 188° and 212°, covers Enterprise Reef.

Helen Point, the western extremity of **Mayne Island,** forms the eastern point of the southern entrance to Active Pass. The thickly wooded land within the point rises gradually and attains a height of 842 feet at **Mount Parke,** the summit of Mayne Island. **Helen Point Light,** unwatched, is shown from a white pyramidal steel frame on a white cylindrical tank with a concrete base. The light is 28 feet above water, and visible 6 miles. The fog signal is a bell sounded from a white square open frame near the light.

Collinson Point, the western point of the southern entrance of Active Pass, is steep-to, rugged, and rocky. The point is easily identified and lies at the foot of a steep summit, 1,090 feet high, about 0.5 mile northwestward of the point.

Mathews Point, with some drying rocks close off it, lies on the northern side of Active Pass 1 mile east-northeastward of Collinson Point.

A rocky ledge which dries 8 feet, lies on a shoal about 400 yards northeastward of Collinson Point. A rocky patch, well marked by kelp and having several heads with depths of 5 feet, lies within about 250 yards of the shore and about 800 yards northeastward of Collinson Point.

Mary Anne Point, around which Active Pass turns sharply to the northward lies about 1,200 yards eastward of Mathews Point, and between these points is a bight whose shores are foul. **Mary Anne Point Light** is shown from a white pyramidal steel frame on a white steel cylindrical tank with a concrete base. The light is 30 feet above water, and visible 3 miles.

Miners Bay indents the southeastern side of Active Pass between **Reserve Point,** about 1.5 miles eastward of Helen Point, and **Laura Point,** about 0.7 mile farther northward. A prominent church is situated near the shore of the bay about 0.5 mile southeastward of Laura Point. The north-flowing tidal current sets strongly into the bay along its northern shore; the south-flowing tidal current sets strongly into the bay along its southern shore. If necessary, anchorage may be obtained in Miners Bay, but

a vessel must go close in to get 12 fathoms. Even then a vessel is barely out of the whirl of the tidal currents, and caution must be exercised. **Mayne** is a small settlement at the head of the bay, where there is a wharf with a depth of 12 feet at its head. Supplies and water can be obtained in small quantities, and there is local steamer service.

Burrill Point, on the western side of Active Pass, lies about 1,200 yards northward of Mary Ann Point, and between these points the shore is indented by two bights, the shores of which are foul. **Rip Point** lies about 1,000 yards northward of Burrill Point.

Georgina Point, the northern extremity of Mayne Island, forms the eastern point of the northern entrance to Active Pass. The point is fronted by rocks, sunken and above water, up to a distance of almost 200 yards.

Active Pass Light* is shown from a white square wooden tower with a dwelling attached, on Georgina Point. The light is 55 feet above the water, and visible 12 miles. The fog signal is an air diaphone horn, sounded from a white house with brown roof, near the light.

Fairway Bank, with a least depth of 5 fathoms, lies in mid-channel about midway between Georgina and Rip Points. The bank is not marked by kelp, but its position is indicated by tide rips, except at slack water.

Georgina Shoals lie about 300 yards off the northern shore of Mayne Island and extend, within the 10-fathom curve, for about 1,300 yards in an easterly direction. The sea breaks occasionally on the western part of the shoals, which has a least depth of 5 feet, lying about 0.3 mile northeastward of the light. Patches with depths of 2 and 3 fathoms lie on the eastern part of the shoal.

Gossip Island, with its southeastern extremity about 800 yards northward of Rip Point, lies on the western side of the northern entrance to Active Pass. **Gossip Shoals,** on which are several drying rocks with depths less than 6 feet, extend from the eastern side of Gossip Island almost 0.3 mile both southeastward and northwestward of the southeastern point of the island. There is a lighted bell buoy off the eastern end of the shoals about 600 yards east-northeastward of the southeastern point of the island.

SAN JUAN CHANNEL

(CHART 6380)

San Juan Channel is the middle one of the three principal channels leading from the eastern part of the Strait of Juan de Fuca to the southeastern end of Georgia Strait; it separates San Juan Island from the islands eastward. It is 13 miles long from its southern end to its junction with President Channel at the northern end; the width varies from 0.5 to 3 miles. San Juan Channel is deep throughout and, except near its southern entrance, there are few off-lying dangers.

McArthur Bank, with a least depth of 15 fathoms, lies about midway between Smith Island and the southern entrance of San Juan Channel.

Cattle Point, the southeastern extremity of San Juan Island forms the western point at the southern entrance to San Juan Channel. **Cattle Point Light** is shown from a white concrete tower on the extremity of the point. The light is 94 feet above water, but is of low power.

Salmon Bank, on the western side of **Middle Channel,** is an extensive shoal lying southward of Cattle Point, with depths ranging from 1½ to 3 fathoms; it is marked by

*Lat. 48°52′.4, Long. 123°17′.4: Charts 6300, 6380.

kelp. A bell buoy is moored off the southern end of the shoal, about 1.5 miles southward of Cattle Point.

Lopez Island is the southeasternmost one of the San Juan Archipelago; **Lopez Hill,** 480 feet high, is near the middle of the island.

Iceberg Point, about 3.3 miles east-southeastward of Cattle Point is on the western extremity of the southern part of Lopez Island. **Iceberg Point Light*** is shown from a white, square house on the western extremity of the point; the light is 33 feet above water, and is visible 9 miles.

Long Island, about 1.5 miles northwestward of Iceberg Point, is the largest of a group of islands and rocks lying off the southwestern part of Lopez Island.

Whale Rocks, two dark rocks about 5 feet high, lie on the eastern side of the Middle Channel about 0.6 mile westward of Long Island. A sunken rock, marked by kelp, lies about 400 yards southward of Whale Rocks, and a reef with 3 fathoms over it, lies 600 yards southward of them.

Richardson is a village with a post office on the northern shore of the cove northward of Iceberg Point, and close northward of **Charles Island.** A wharf, where fresh water is available, extends over rocks to a depth of 12 feet. There is a fishing station located here. Daily communication is maintained by mail steamer with other points on the island and with Seattle, Port Townsend, and Bellingham Bay.

Richardson Light is shown about 200 yards northward of Charles Island from a white arm on an iron post, 19 feet above water, on a ledge extending from the shore of Lopez Island.

Mackaye Harbor, northward of Iceberg Point, affords good shelter in 5 to 6 fathoms, soft mud, and small craft with local knowledge, can obtain excellent shelter in **Barlow Bay,** on the southern side of the harbor. Vessels approaching Mackaye Harbor or Richardson should pass at least 0.3 mile southward and eastward of the offlying islands and islets. Local vessels by keeping close to the northern shore to avoid rocks near midchannel, use a small channel between Lopez and Charles Islands, but this channel should not be attempted without local knowledge. **Twin Rocks,** in mid-channel, is marked by a beacon.

Davis Point, the southwestern extremity of Lopez Island, is on the eastern side of the south entrance to San Juan Channel. **Deadman Islet** lies close off the eastern side of the entrance, and several rocks lie within 600 yards northward of the islet.

Goose Island, small and low, lies about 0.5 mile northward of Cattle Point and close off the western side of the entrance to San Juan Channel.

Shark Reef, awash at low water, lies about 1.2 miles northward of Deadman Islet and close off some white cliffs on the eastern side of San Juan Channel.

Griffin Bay, indents the eastern shore of San Juan Island immediately within the entrance and on the western side of San Juan Channel. There are numerous rocks and shoals in this bight, and the shore should not be approached closer than 0.5 mile.

North Bay comprises the northwestern part of Griffin Bay and is entered between **Pear Point** and **Dinner Island.** The village of **Argyle** is situated on the shores of North Bay; there are a small wharf that dries at low water and a sawmill there. The cove affords fair anchorage in 7 to 10 fathoms, about 800 yards northward of Dinner Island. In the approaches to the cove are two dangers: **Argyle Shoal,** with a depth of 1¾ fathoms and marked by kelp, lies about 1,200 yards eastward of Dinner Island; and a rocky shoal with 1 fathom over it and marked by kelp, lies about 700 yards southeast-

*Lat. 48°25′.3, Long. 122°53′.6: Charts 6300, 6380, 6382.

ward of Dinner Island. Rocks and shoals, some of which bare at low water, extend southward and southeastward of Dinner Island for a distance of about 600 yards. The passage westward of Dinner Island should not be attempted.

Fisherman Bay, on the eastern side of San Juan Channel abreast North Bay, is a shallow lagoon entered by a narrow, tortuous channel. Good anchorage, with shelter from all winds, may be had in 10 to 12 feet, soft bottom, for small, light-draft vessels with local knowledge. The tidal currents have considerable velocity. **Lopez** is a small village with a post office, situated at the entrance.

About 2 miles northward of Lopez is the southern entrance to Upright Channel, described on page 288.

At **Turn Island,** San Juan Channel turns northwestward for about 9 miles, and connects at its northern end with Haro Strait and President Channel.

Turn Rock, about 0.2 mile eastward of Turn Island, is a ledge bare at half tide, and should be given a berth of not less than 100 yards.

Turn Rock Light* is shown from a white square house with a black cylindrical base on Turn Rock. The light is 18 feet above water, and of low power.

Reid Rock, about 1.3 mile northwestward of Turn Rock, lies in midchannel off the entrance to Friday Harbor. The rock has a depth of 2¼ fathoms over it, rising abruptly from deep water. It is marked by a buoy on the eastern side of the rock.

Friday Harbor, on the eastern shore of San Juan Island, about 1 mile westward of Turn Rock, is a small cove about 1 mile long and nearly as wide. **Brown Island,** which is wooded, occupies the middle of the harbor. Shoals extend about 200 yards off both its eastern and southern shores; a shoal, with 2½ fathoms over it, extends nearly into midchannel from the western shore of the island. The harbor may be entered either eastward or westward of Brown Island, but in both cases the San Juan Island shore should be favored to avoid the shoals off Brown Island. Anchorage may be had off the wharves in 6 to 7 fathoms.

Friday Harbor, on the western shore of the cove, is a county seat, port of entry, and the most important town in the San Juan Archipelago. It is the center of a prosperous agricultural district, and the headquarters for the fishing fleet operating through the western part of the archipelago. Produce and fish are shipped, and a salmon cannery, a creamery, and a pea cannery are located here.

There is a **chart agency** of the United States Coast and Geodetic Survey situated here.

The **University of Washington** maintains a station about 0.8 mile northward of the town of Friday Harbor, for oceanographical and marine biological research. The pier makes a prominent landmark in entering Friday Harbor. The wharf resembles a half section of a cantilever bridge, supported near the middle and at the shore end; the free end extends about 35 feet beyond the support. There is a substantial landing wharf near the main building.

Wharves.—There are a number of wharves built out to deep water, at which water and fuel oils can be obtained. The city wharf has a depth alongside of 16 feet. The wharves eastward of the city wharf have more water alongside, and those westward of it have less than at the city wharf.

Customs.—The customs offices are located at the bank building and on the wharf at the ferry slip.

*Lat. 48°32′.0, Long. 122°57′.8: Charts 6300, 6380.

Repairs.—A shipyard of sufficient size to handle small boats is located here. The small-boat repair yards are at the south end of the harbor.

Communication is maintained by steamer with other ports in the islands and the mainland; there are connections with the general telephone system.

Point Caution, about 2.2 miles northwestward of Turn Island, lies on the southwestern side of San Juan Channel. The point is steep-to, and between it and the head of Rocky Bay, about 4 miles northwestward, the southwestern shore of the channel is free from off-lying dangers.

Hicks Bay on the opposite side of the channel on the southern side of Shaw Island has a small, private landing.

Parks Bay is immediately northward of **Point George** on Shaw Island and about 2 miles northward of Turn Rock. It affords a good anchorage for small vessels in 6 to 8 fathoms soft bottom. The harbor is clear, but a shoal extends 300 yards from its head.

Wasp Islands lie in the western approach to West Sound between **Neck Point,** the northwestern extremity of Shaw Island and **Steep Point,** the southwestern extremity of Orcas Island. Several narrow channels lead between the islands; the channels in general use are the North and Pole Passes, close under the Orcas Island shore. The tidal currents have considerable velocity in the channels, which should be attempted only by vessels with local knowledge.

North Pass, between Steep Point and Wasp Islands, leads eastward from San Juan Channel to Deer Harbor and Pole Pass. The pass is about 0.2 mile wide between Steep Point and **Reef Island,** and is free of outlying dangers, except for a rock with a depth of 1¾ fathoms about 0.3 mile eastward of the northern end of Reef Island.

Deer Harbor, at the eastern end of North Pass, lies eastward of Steep Point. Good anchorage may be had in 6 to 7 fathoms about 0.2 mile from the head of the harbor. **Fawn Island** lies near the entrance of the harbor and about 200 yards from the western shore; vessels may pass on either side of the island.

A midchannel course leads through North Pass and to the anchorage north of Fawn Island. The eastern shore of Deer Harbor should be given a berth of at least 300 yards because of a shoal which in some places extends more than 200 yards.

Deer Harbor, where there is a post office, is a small village on the eastern shore near the head of the harbor. There is a cannery on a point opposite the village, and a small wharf extending to a depth of 12 feet. Small quantities of provisions and gasoline may be obtained.

A rock with a depth of 4 feet over it lies about 100 yards north-northwestward of the wharf and constitutes a danger to steamers pulling away from the wharf.

Crane Island lies off the entrance to Deer Harbor and almost a mile southeastward of Steep Point. The northern shore of the island is foul, and in places, shoals extend 250 yards off it; a rock with a depth of 5 feet lies 250 yards off the northern shore and about 750 yards west-northwestward of Pole Pass Light. Foul ground extends about 300 yards eastward from the eastern extremity of the island. There is a small private landing on the eastern side of the island.

Pole Pass leads from Deer Harbor to West Sound, and separates Crane from Orcas Island; in its narrowest part the fairway is 75 yards wide. Pole Pass should not be attempted without local knowledge.

Pole Pass Light is shown from a small white house on Orcas Island, at the western end of Pole Pass; the light is 18 feet above water.

Wasp Passage leads from San Juan Channel to West Sound and separates Crane

Island from the northern shore of Shaw Island. This passage should also not be attempted without local knowledge.

Local vessels, bound from Friday Harbor to Deer Harbor, use a clear, deep channel, about 70 yards wide through the rocks and shoals lying between Cliff Island and Low Island about 600 yards westward.

Bell Island, small and wooded, lies about 0.3 mile eastward of Crane Island. A rock which bares at extreme low water, lies about 300 yards eastward of the island and about 300 yards northward of this rock, a 1-fathom shoal lies almost in midchannel. Vessels using Pole Pass keep the northern shore of Bell Island close-to in order to avoid reefs and shoals extending from the opposite side of the pass.

Wasp Passage Light is shown from a beacon consisting of a white cross arm on a pipe spindle, situated on the rock 300 yards eastward of Bell Island.

Cliff Island, the southernmost of the Wasp Islands, lies about 300 yards northward of Neck Point. **Low Island,** small and 10 feet high, lies about 600 yards westward of Cliff Island. **Nob Island,** 40 feet high, lies close-to and northwestward of Cliff Island.

Cliff Island Light* is shown from a small square white house on a concrete pier; the light is 15 feet above the water.

Yellow Island, the westernmost of the Wasp Islands, lies about 0.8 mile west-northwestward of Neck Point; the island is small, grassy, and nearly bare of trees. A shoal extends 300 yards westward of the island and terminates in a rock, marked by kelp, with a depth of 1 fathom over it. This island should be given a berth of not less than 0.5 mile. **McConnell Island,** northwestward of Yellow Island, is the largest of the group. **Coon Island** lies close to and southeastward of McConnell Island. **Bird Rock,** awash at high tide, lies between McConnell and Crane Islands.

Jones Island lies on the eastern side of the northern entrance to San Juan Channel; the island is wooded.

Spring Passage separates Jones Island from the southwestern extremity of Orcas Island. With the exception of a shoal that fringes the eastern side of Jones Island and in places extends as far as 250 yards offshore, the passage is free of danger.

Rocky Bay, on the southwestern side of San Juan Channel, is a small open bight. **O'Neal Islet,** surrounded by a shoal, lies almost in the middle of the bay, and a reef that is usually marked by a breaker, lies near the head of the bay.

Limestone Point, about 1.2 miles north-northwestward of O'Neal Islet, forms the western point of the northern entrance to San Juan Channel; the point is the northeastern extremity of San Juan Island. Heavy tide rips and eddies are formed off Limestone Point and **Green Point,** lying 0.7 mile northward, and forming the eastern end of Spieden Island which is described on page 276.

Flattop Island, prominent in the northern approaches to San Juan Channel, lies about 1.2 miles northeastward of the eastern end of Spieden Island. It is about 130 feet high, flat on top, and sparsely covered with underbrush and trees. **Gull Rock,** 30 feet high, of small extent and bare, lies about 0.3 mile northwestward of the island.

White Rock, 35 feet high, lies in the northern part of San Juan Channel, about midway between Flattop and Waldron Island. Waldron Island is described on page 276. Rocks, bare at low water and marked by kelp, extend nearly 600 yards northwestward from White Rock.

*Lat. 48°35′.3, Long. 123°00′.8: Chart 6300, 6380.

Danger Rock, with 2 feet over it and marked by kelp, lies 600 yards southeastward of White Rock.

The northwestern approach to San Juan Channel, from Haro Strait and Boundary Pass, is between Waldron Island on the east and Johns Island and the dangers southeastward of it on the west. Johns Island is described on page 276.

President Channel, separating Waldron and Orcas Islands, is about 5 miles in length, and has a least width of 1.2 miles. The depths are generally great and the passage is free of dangers. The tidal currents have a velocity of 2 to 5 knots, and off the northern point of Waldron Island, and between Waldron and Patos Islands, there are heavy swirls and tide rips, especially with an adverse wind. The rips are generally heaviest with the ebb current. Rips and swirls are also heavy off Limestone Point and the eastern end of Spieden Island.

Orcas Island is wooded and mountainous. **Mount Constitution,** 2,409 feet high, in the eastern part of the island and marked by a stone lookout tower, the top of which is at elevation 2,454 feet; **Turtle Back Range,** 1,497 feet high; and **Orcas Knob,** 1,050 feet high, conical and bare on the summit, in the western part of the island, are prominent and easily recognized from northward and southward.

Point Doughty, the northwestern extremity of Orcas Island, is bare and terminates in a small knob on its outer end. **Freeman Island** is a small islet in the broad open bight southward of Point Doughty. Foul ground, marked by kelp, extends about 350 yards westward from the southern point of this bight, which lies about 1.2 miles southward of Point Doughty. A 3-fathom shoal lies about 400 yards offshore at about 1.2 miles eastward of Point Doughty. A mooring buoy is near the shore southward of this shoal.

Parker Reef, consisting of two rocky patches, bare at low water, lies about 0.7 mile off the northern shore of Orcas Island, and about a mile northwestward of Point Thompson. Kelp covers the reef and the area between it and the shore.

Point Thompson lies almost 3 miles eastward of Point Doughty. **North Beach,** just eastward of Point Thompson, has a landing for the automobile ferry which connects it with Lummi Island and the mainland.

A passage between Sucia Island on the north, and Orcas Island on the south, connects the northern end of President Channel with the junction of Georgia and Rosario Straits.

MINOR PASSAGES, SAN JUAN ARCHIPELAGO

(CHART 6380)

Upright Channel between Lopez and **Shaw Islands,** is about 3 miles long and has an average width of about 0.8 mile; **Canoe Island** off **Flat Point,** contracts the passage to a width of 600 yards. A rock with a depth of ¼ fathom lies about 300 yards southward of the southern point of Canoe Island. A sunken rock, marked by kelp, lies on the northwestern side of the channel and about 300 yards eastward of the southern point of Shaw Island. The depths in the channel range from 20 to 35 fathoms and, with the exception of the above mentioned dangers, it is free of danger. Anchorage for small vessels may be had in **Indian Cove,** westward of Canoe Island, in 6 to 7 fathoms, soft bottom.

Upright Head,* the northern extremity of Lopez Island, is a narrow peninsula which attains an elevation of 260 feet. An automobile ferry slip is situated in the small cove

*Lat. 48°34′.4, I ong. 122°53′.0: Charts 6380, 6300.

at the northeastern extremity of the peninsula. There is daily ferry service with the other islands and the mainland.

Harney Channel, between the northern shore of Shaw Island, and Orcas Island, is the widest approach to West Sound from the eastward, but small vessels with local knowledge may approach from the westward by Pole Pass or Wasp Passage. Harney Channel has depths of 10 to 25 fathoms, and there are no off-lying dangers.

Orcas, situated on the northern shore in a cove at the western end of Harney Channel, is a small settlement and summer resort, and has a post office and is connected to the general telephone system. A wharf with a depth of 10 feet at its head is situated here; water and gasoline are available from pipe lines on the wharf. There is an automobile ferry slip just eastward of the wharf. Orcas is a port of entry; the customs office is on the ferry slip. There is daily communication by mail boat and ferry to the other islands and the mainland.

A rock with 15 feet over it lies about 125 yards southward of the wharf; there is deep water between the rock and the beach.

Blind Bay, a small cove on the southern shore of Harney Channel, is shoal and in it are several reefs. **Blind Island** lies in the entrance to the bay, and a reef, bare at low water, extends 200 yards from the western entrance point of the cove. A rock, partly bare at low water, is reported to lie about 100 yards 132° from Blind Island, at the entrance to the bay. Several rocks, awash, lie within about 600 yards northwestward of the island.

Shaw Island, a village located at the eastern entrance point of Blind Bay, has a post office and is connected to the general telephone system; local steamers call regularly. It has a store, warehouse, wharf built out to 12 feet, and a ferry slip; provisions and gasoline may be obtained in small quantities.

Broken Point, about 1.2 miles westward of Blind Island, extends about 0.3 mile northward from the northern side of Shaw Island.

North Pass is described on page 286.

Pole Pass is described on page 286.

Wasp Passage is described on page 286.

West Sound indents the western part of the southern shore of Orcas Island, and with an average width of about 0.8 mile, trends northwestward for about 2.8 miles. The depths range from 7 fathoms to over 20 fathoms. Anchorage in 7 to 12 fathoms, may be had anywhere in the sound northward of Double Island.

Double Island consists of two small islands connected at low water; it lies close to the western shore near the entrance. **Victim Island** lies close to the western shore about 0.2 mile northward of Double Island.

Westsound, a settlement with a post office, is situated in a cove on the eastern shore of the inlet about 2 miles above the entrance. There is a wharf with a depth of 12 feet of water; only a few piles remain of an old sawmill wharf. Care should be taken when leaving the wharf to avoid some submerged piling about 100 feet southwestward of the wharf. Provisions in small quantities are available.

Sheep Island, a low islet in the southern part of the cove, is connected to the shore at low water; a shoal extends about 150 yards westward from the island.

Harbor Rock, with a depth of ¾ fathom, lies in midchannel about 0.8 mile from the head of West Sound; the rocky patch is of small extent and is surrounded by depths of 4 to 10 fathoms.

East Sound, on the southern shore of Orcas Island, extends northwestward for about 6 miles. The depths vary from 15 fathoms at the entrance to 9 fathoms at less than 0.2 mile from the head. There are no outlying dangers and the shores may be approached to within 0.2 mile; however, a bank with depths less than 5 fathoms extends about 700 yards off the western shore about 0.8 mile within the entrance. Anchorage may be obtained anywhere in the sound.

Shag Rock, marked by a spindle, lies about 300 yards offshore and about 0.6 mile eastward of **Foster Point.** The rock bares at high water and a ledge extends about 150 feet northward from the rock.

Olga, a summer resort with a post office, is situated on the western shore of **Buck Bay,** a small cove on the eastern shore of the sound, just within the entrance. There is a wharf with 20 feet at its head; provisions may be obtained in small amounts. Telephone facilities are available and local steamers call regularly.

Rosario, a settlement with a post office, is situated on the shores of **Cascade Bay,** a small cove on the eastern side of the sound about 3 miles within the entrance. There is a landing wharf with a depth of 12 feet at its head; fresh water is piped to the wharf. A large private residence on the western point to the bay is prominent.

Eastsound, a summer resort with a post office, is situated in the western of two small coves at the head of East Sound. It is the second largest village in San Juan Archipelago. Gasoline, water, and lubricating oil may be obtained at the wharf, which is built out to 10 feet. Farm produce is shipped and general merchandise received. Communication with the other islands and the mainland is maintained by daily boats and telephone.

Obstruction Pass, about 350 yards wide at its narrowest part, separates Obstruction Island from the southeastern part of Orcas Island, and leads westward from Rosario Strait to the inner passages and sounds of the San Juan Archipelago. A submerged rock, marked by kelp, has been reported to lie in midchannel near its narrowest part. A ferry slip extends about 250 feet from the northern shore of the pass.

Obstruction Island is marked on its eastern and southern ends by lights. **Obstruction Point Light** is shown from a small white house on the southern point of the island; the light is 22 feet above water, and visible 5 miles.

Obstruction Passes Light* is shown from a small white house on the eastern point of the island; the light is 23 feet above water, and visible 9 miles.

Deer Point, on the northern side of the eastern approach to Obstruction Pass, forms the southeastern extremity of Orcas Island. A lighted bell buoy is moored close southeastward of the point.

Peavine Pass separates the northern extremity of **Blakely Island** from the southern shore of Obstruction Island. The pass is a little over 200 yards wide at its narrowest part, and in midchannel the least depth is 6 fathoms. Peavine Pass is both safer and straighter than Obstruction Pass. A spindle marks a group of bare rocks which lie about 0.2 mile offshore on the southern side of the entrance.

The currents through the passes have estimated velocities of 5½ to 6½ knots at times. Heavy tide rips occur eastward of Obstruction Island.

A rock with a depth of 1¾ fathoms lies about 0.5 mile westward of the northern part of Blakely Island and 1.3 miles 219° from the light on the southern point of Obstruction Island.

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*Lat. 48°35′.9, Long. 122°48′.2: Charts 6380, 6300.

Thatcher Pass, between the southern extremity of Blakely Island and the northern shore of **Decatur Island,** is about 0.5 mile wide in its narrowest part. With the exception of Lawson Rock, Thatcher Pass is deep and free of danger. **Lawson Rock,** which dries, lies in midchannel, about 700 yards northward of Fauntleroy Point; it is marked on its southern edge by a buoy. **Fauntleroy Point,** the northeastern extremity of Decatur Island is marked by a light shown from a small white house; the light is 40 feet above the water, and visible 8 miles. With a southerly wind and the ebb tide, heavy rips will be encountered off the eastern entrance to Thatcher Pass.

Lopez Sound, on the eastern side of Lopez Island, may be entered from Rosario Strait by Thatcher Pass or Peavine Pass. The depths in the greater part of the sound are from 3 to 5 fathoms, mud, but along the eastern shore, a narrow and deeper channel extends as far southward as **Center Island.** The sound is of little commercial importance at present.

Thatcher, a small village with a post office, is situated in the shallow cove on the western side of Blakely Island; at the village is a small wharf.

Port Stanley is a small village with a post office, situated on the shores of **Swifts Bay,** on the northeastern side of Lopez Island. There is a landing wharf built out to 12 feet at the village.

Leo Reef, awash at high tide, lies in the entrance to Swifts Bay and is marked by a light. **Leo Reef Light** is shown from a small white cylindrical structure with a concrete base on the eastern end of the reef; the light is 15 feet above water, and visible 9 miles.

Decatur, a small village with a post office, is situated on the western side of Decatur Island, about 1 mile eastward of **Trump Island.** At the village is a wharf with 8 feet of water at its head.

A small shipyard is located on the southern end of Decatur Island in the cove eastward of Center Island. Cannery tenders, launches, and scows ar built and repaired here.

Lopez Pass, at the southern extremity of Decatur Island, leads from Rosario Strait into Lopez Sound at a point about 2 miles from its head. The pass has depths of 9 to 12 fathoms, but is very narrow and little used.

A light is shown from a small white house at the southern point of Decatur Island; the light is 21 feet above water, and visible 9 miles.

ROSARIO STRAIT

(CHART 6380)

Rosario Strait is the easternmost of the three main channels leading from the Strait of Juan de Fuca to Georgia Strait. It is about 20 miles long and from 1.5 to 5 miles wide. The water is deep and the most important dangers are marked.

The strait is in constant use by vessels bound to Bellingham, Anacortes, or the various ports in the San Juan Islands. Vessels bound for British Columbia or Alaska, also frequently use it in preference to the passages farther westward, when by so doing greater advantage can be taken of the tidal currents.

The **currents** in the passes attain velocities of 3 to 7 knots at strength and should be carefully taken into account by vessels using the strait at night or in thick weather. On the ebb of the larger tide, a southerly wind causes tide rips, dangerous to small craft, off the entrances to Lopez, Thatcher, and Obstruction Passes. The current tables should be consulted for times and velocities.

Point Colville,* the southeastern extremity of Lopez Island, forms the western point of the southern entrance to Rosario Strait.

Colville Island, 64 feet high, small and bare of trees, lies about 0.5 mile southwestward of Point Colville; the island should be given a berth of not less than a mile.

Davidson Rock, which bares at extreme low water, lies about 600 yards eastward of Colville Island. The rock is marked by a light shown from a white house on a concrete pier. **Davidson Rock Light** is 25 feet above the water, and visible 10 miles. The fog signal is sounded on a bell. Heavy kelp extends westward of Colville Island.

A shoal with a least depth of 3¾ fathoms and marked by a lighted buoy, lies about 1.9 miles 101° from Davidson Rock Light. The ship passage lies between Davidson Rock Light and the buoy.

Aleck Bay is the westernmost and largest of three small bays on the southern shore of Lopez Island. It affords good anchorage for small vessels in 4 to 7 fathoms, mud bottom; good protection is afforded except from heavy southeasterly winds. **Hughes** and **McArdle Bays,** adjacent, are smaller, with less protection, and are not used. An irregular, dark-brown rock, 40 feet high, lies about 0.3 mile offshore, on the western side of the entrance to Aleck Bay; from this rock a reef and detached rocks, awash, extend more than 200 yards eastward. Two shoals with least known depths of 4 and 4¾ fathoms lie, respectively, about 700 yards 278° and 1,050 yards 318°, from the western point of Colville Island. Except for these dangers, the passage inside Colville Island is clear and is used by small boats.

Lawson Reef lies about 1.7 miles 260° from the western extremity of Deception Island. It is of small extent, with a least depth of 1¾ fathoms, and is marked by a buoy on the eastern edge of the reef. Depths of less than 10 fathoms extend about 700 yards northward and 1,000 yards southwestward from the reef.

A bank with depths of 11 to 20 fathoms extends about 1.5 miles southwestward and thence 2.2 miles northwestward and terminates in the 3¾-fathom shoal, marked by a lighted buoy and described in the preceding paragraph.

Deception Pass, between Whidbey Island and Fidalgo Island, is about 2 miles long and connects the northern end of Skagit Bay, described on page 296, with the southern end of Rosario Strait. Near the middle of the pass the navigable channel leads southward of **Pass Island,** which reduces the width of the channel to about 200 yards.

Deception Pass is commonly used by local vessels bound from Seattle to Anacortes, Bellingham, and ports in the San Juan Islands. Vessels plan to make the pass at the time of slack water, as the velocity of the stream at other times makes it unavailable to most vessels. Some fast vessels run it at all stages of the tide. The pass is also frequently used by tows of logs from the northward, bound to Everett or Seattle, which take this route to avoid the rough weather westward of Whidbey Island.

The **currents** in the narrows of Deception Pass attain velocities of 5 to 8 knots at strength, at which times strong eddies are formed along the shores. Daily predictions of the times of slack water and the times and velocities of strength of current for Deception Pass are given in the *Pacific Coast Currents Tables* published annually, in advance, by the United States Coast and Geodetic Survey.

Canoe Pass lies between the northern shore of Pass Island and Fidalgo Island. At this point Deception Pass is crossed by a fixed highway bridge with vertical clearances above MHW of 146 feet over Deception Pass and 156 feet over Canoe Pass. This pass is not recommended except for small craft with local knowledge.

Deception Island lies about 0.4 mile northwestward of **West Point** the northwest-

*Lat. 48°25′.3. Long. 122°48′.7: Charts 6380, 6300.

ern extremity of Whidbey Island. Foul ground exists between West Point and Deception Island. Vessels should not attempt to pass between them.

Deception Pass Light, on the southwestern end of Fidalgo Island, is shown from a red, cylindrical house on a skeleton tower; the light is 60 feet above the water, and visible 8 miles.

Ben Ure Island Light, shown from a red cylindrical house on a skeleton tower at the eastern extremity of **Ben Ure Island,** on the southern side of Deception Pass, about one mile southwestward of **Hoypus Point,** which is on the southern shore at the eastern entrance to the pass; the light is 25 feet above water, and visible 8 miles.

Strawberry Island lies about 400 yards northward of Ben Ure Island. A reef, marked by kelp, extends from the southern side of the island.

Directions, Deception Pass.—In approaching Deception Pass from the westward the best water will be found 0.2 mile westward of **Rosario Head,** the northwestern entrance point to Reservation Bay. Steer a southeasterly course to pass about 100 yards southwestward of Deception Pass Light; then follow an easterly course through the middle of the pass, being careful to guard against sets from the current when running partly across it. After passing under the bridge favor slightly the northern shore so as to avoid the pinnacle rocks and ledges making out from the southern shore. After leaving Pass Island, steer to pass about midway between Ben Ure and Strawberry Islands. Strawberry Island should not be approached within 125 yards because a reef, marked by kelp, extends southward of the island. From a position off Ben Ure Island Light steer a northeasterly course to pass about midway between Hoypus and **Yokeko Points.** The current northward of Strawberry Island sets northeastward and this should be guarded against.

Reservation Bay, a small bight between **Lighthouse Point** and Rosario Head, offers anchorage for small craft in 2¼ fathoms, mud bottom.

Sares Head, about a mile northward of Deception Island, is steep-to and attains a height of 480 feet.

Northwest Island, 28 feet high and grass-covered, lies between Rosario and Sares Heads.

Langley Point lies about 2.1 miles northward of Deception Island.

Burrows Bay indents the western shore of **Fidalgo Island** between Langley Point and Fidalgo Head. It is a broad, open bight, affording anchorage in the northern part in 15 or 16 fathoms, soft bottom. Protection from westward and northward is afforded by **Burrows** and **Allan Islands,** 630 and 270 feet high, respectively, but the bay is exposed in southerly weather. In the southeastern part of the bay, the depths are less than 6 fathoms, and in places, shoals extend almost 0.4 mile off the eastern and southern shores of the bay. **Young Island** lies southwest of and close to Burrows Island. Eastward of the passage between Allan and Burrows Islands is a middle ground with a least depth of 5 fathoms. Vessels using Deception Pass, bound to or from ports in the islands or from Bellingham Bay, pass through Burrows Bay and the passage northward of Burrows Island.

Burrows Island Light* is shown from a white square wooden tower on a building situated at the western end of Burrows Island; the light is 57 feet high, and visible 13 miles. A fog signal is sounded on a reed horn.

Williamson Rocks, a group of small, grass-covered islets, close together, and several small rocks extending westward thereof, lie about 0.5 mile southward of Allan Island.

*Lat. 48°28′.6, Long. 122°42′.7: Charts 6380, 6300.

Dennis Shoal, which bares at low water, lies about 500 yards off the southern shore of Allan Island and 0.6 mile 328° from Williamson Rocks. A small, bare rock lies 700 yards 58° from Langley Point, and about 500 yards offshore. A rock, awash, lies about 0.9 mile 32° from Langley Point, and 650 yards off the southern point of a small cove on the eastern shore of Burrows Bay.

Flounder Bay, a shallow lagoon at the northern end of Burrows Bay, has been improved and is now used as a log pond and lumberyard. There is a wharf with 30 feet alongside its western end. A sawmill with a prominent brick stack is located here. The sawmill is known as the "Burrows Bay Mill"; however, it has not been operated for several years nor has there been any shipping here.

Bird Rocks, consisting of three rocks close together, lie almost in the middle of Rosario Strait, about 2 miles 284° from Burrows Island Light; the southernmost and largest is 30 feet high. There is deep water close-to and passage may be made on either side of the rocks.

Belle Rock, bare at extreme low water, lies about 0.5 mile 39° from Bird Rocks. **Tide Point,** the western extremity of Cypress Island, and **Lawrence Point,** the eastern extremity of Orcas Island, in range, bearing about 359°, lead about 1,200 yards eastward of Belle Rock.

Belle Rock Light is shown from a white square house with a cylindrical base; the light is 20 feet above water and is visible 9 miles.

Kellett Ledge, about 2 miles northward of Point Colville, lies 700 yards off **Cape St. Mary.** The ledge is of small extent, marked by kelp, and bares at lowest tides.

Lopez Pass and Light are described on page 291.

Dot Rock, about 2.8 miles northward of Cape St. Mary, lies close under a white cliff on the southeastern side of Decatur Island.

Decatur Head, the eastern extremity of Decatur Island, is a small peninsula having a height of 140 feet and lying about a mile north-northeastward of Dot Rock.

James Island lies close off Decatur Head, and between them is a deep but narrow passage; on the island are two hills with heights of 260 and 219 feet.

Thatcher Pass is described on page 291. Guemes Channel is described on page 297. Bellingham Channel is described on page 299.

Pointer Island, locally known as **White Rock,** is 16 feet high and lies about 600 yards off the southeastern shore of Blakely Island on the northern side of the entrance to Thatcher Pass.

Black Rock, 4 feet high, lies about 0.8 mile 58° from Pointer Island and 0.5 mile from the Blakely Island shore; it is marked by a spindle surmounted by a barrel. There is a passage between Blakely Island on the west and Black Rock and Pointer Island on the east, but it is not recommended.

Cypress Island, 1,530 feet high, steep on the lower slopes and gently rounding at the top, lies northward of the entrance to Guemes Channel, and from southward the island appears to lie in the middle of Rosario Strait.

Reef Point, the southwestern extremity of Cypress Island, has a shoal extending about 500 yards southward; the outer end of the shoal is marked by a buoy. Vessels rounding the point should give the buoy a berth of 400 to 500 yards to avoid submerged piles that may be in this vicinity.

Strawberry Island, small and low, lies about 400 yards from the western shore of Cypress Island. There is a passage eastward of it, but it is not recommended. An indifferent anchorage may be had in **Strawberry Bay** in 7 fathoms; it is seldom used.

Towhead Island, small, round, and wooded, lies about 400 yards northward of the northern extremity of Cypress Island. The passage between them is used by local vessels, especially those plying between Bellingham Bay and Obstruction Pass.

Cypress Reef is a dangerous, rocky patch westward of Towhead Island. The southern end, bare at low water, lies 550 yards 289° from Towhead Island, and from this point it extends northward for 650 yards with depths of 1½ to 2½ fathoms. It is well marked by kelp.

Lydia Shoal, of small extent and with a least depth of 3¾ fathoms, lies about a mile northeastward of the light on the eastern end of Obstruction Island.

Obstruction Island Passes are described on page 290.

Buckeye Shoal, with a least depth of 4 fathoms lies about 1 mile 320° from Towhead Island; it is marked by a buoy.

Peapod Rocks are a group of small rocks extending about a mile in a general north-northeasterly direction, parallel with and a little over 0.5 mile from the Orcas Island shore. They are bare of trees; the northernmost rock is the highest and largest and is marked by an unwatched light shown from a sound reflector board on a white octagonal concrete house. **Peapod Rocks Light** is 35 feet above water; the fog signal is sounded on a bell. A rock with a depth of 2 fathoms, lies off Doe Bay, about 0.7 mile 283° from the southern Peapod. Vessels using the passage westward of the Peapods must favor the southern Peapod to avoid this rock; otherwise this passage is clear. Vessels must not pass between the rocks forming the Peapod group.

Doe Bay indents the southeastern shore of Orcas Island abreast Peapod Rocks. **Doebay,** a village with a post office, is situated on the shore of the bay. There is a wharf with 12 feet at its head; during strong southerly winds, the wharf should not be approached.

Sinclair Island, northward of Cypress Island, is wooded and comparatively low. In places, reefs extend off the northern shore for nearly 0.5 mile.

Boulder Reef is a dangerous shoal which extends over 0.5 mile from the northwestern shore of Sinclair Island; portions of the reef uncover at half tide, and a large boulder lies at the inner part of the reef. It is well marked by kelp, but this is frequently drawn under by the current. The outer end of the reef is marked by a buoy.

Urban is a village with a post office situated at the southwestern end of Sinclair Island. There is a wharf there with 12 feet of water at its head.

Lummi Island, which is wooded and about 8 miles long, forms the eastern side of the northern end of Rosario Strait, opposite Orcas Island. The northern part is low, but in the southern part **Lummi Peak** attains an elevation of 1,740 feet. Lummi Island has automobile ferry service with Orcas Island and the mainland.

Lummi Rocks, a group of rocks and islets, lie off the southwestern shore of Lummi Island, about 3 miles northwestward of the southern extremity.

Shoals extend over 0.5 mile from **Point Migley,** the northwestern extremity of Lummi Island; the northwestern edge of the shoals is marked by a buoy. Sinclair Island, open westward of **Village Point,** leads westward of this shoal.

Clark Island and **Barnes Island,** with a small number of islets adjacent, form a group lying almost in the middle of Rosario Strait, about 2.5 miles northwestward of Lawrence Point, the eastern extremity of Orcas Island. These islands may be passed on either side, but they should be given a berth of 0.5 mile.

Matia Island, 120 feet high and wooded, lies about 1.5 miles eastward of Sucia Islands. **Puffin Island,** with a reef extending about 400 yards eastward from the south-

ern extremity, lies close eastward of Matia Island, from which it is separated by a narrow channel with a least charted depth of 5½ fathoms.

Puffin Island Light is shown from a small white house on a black cylindrical structure, on the outer extremity of the reef extending eastward from Puffin Island; the light is 20 feet above water.

Sucia Islands are described on page 277. Ewing Island is described on page 277. Patos Island is described on page 277.

Alden Bank, within the 10-fathom curve, is about 3 miles long in a southeasterly direction, with a greatest width of 1.5 miles. The shoalest part, on which are patches of 2¾ and 3 fathoms, covering a considerable area, is near the southeastern part of the bank and lies approximately 3.2 miles 13° from the middle of Matia Island, and 5 miles 305° from Point Migley, the northwestern point of Lummi Island. A lighted buoy is moored at the southern extremity and another buoy marks the eastern edge of the bank.

Directions for Rosario Strait are given on page 49.

SKAGIT BAY, NORTHERN PART AND SIMILK BAY

(CHART 6380)

Skagit Bay lies between the northern part of Whidbey Island and the mainland. The bay is entered from the north through Deception Pass, described on page 292; from the south, the approach is through Saratoga Passage, described on page 337. Skagit River, described on page 340, empties in the southeastern part of the bay.

The greater portion of Skagit Bay is filled with flats, bare at low water. Shoals extend about 100 to 300 yards from the Whidbey Island shore. Along the shore of Whidbey Island, between it and the edge of the flats, is a narrow channel varying in width from 0.2 to 0.5 mile. This channel is about 6.5 miles long from its southern end to Hope Island, where it narrows to 150 yards. The channel is marked with navigational aids from Deception Pass to the jettied entrance of Swinomish Slough. The main channel from Deception Pass southward through Skagit Bay, has a controlling depth of 6½ fathoms. Current velocities up to 2 knots have been observed in the channel.

Skagit Island, 113 feet high, and steep-to on its southern extremity, and **Kiket Island,** 194 feet high and steep-to along its northwestern side, lie eastward of Hoypus Point, on the eastern side of Skagit Bay.

Similk Bay is located in the northeastern end of Skagit Bay. The northeasterly portion of Similk Bay is used extensively for log rafting operations and is unsafe for navigation.

Hope Island, in the northern part of Skagit Bay, is marked by a light shown from a red cylindrical house on a skeleton tower at the southwestern extremity of the island. **Hope Island Light*** is 23 feet above the water, and visible 8 miles. The eastern shore of the island is fringed with off-lying rocks.

Ala Spit, abreast the western end of Hope Island, is a low, projecting point; a shoal extends about 350 yards from the point. A wharf with a bunker for loading gravel, is built about 400 yards southward of Ala Spit.

Good anchorage may be had northward of Hope Island, and vessels at times make use of this anchorage area while waiting for slack water in Deception Pass.

The narrow channel eastward of Hope Island is used by small craft with local knowledge. This channel with a controlling depth of 5 fathoms, passes about 130 yards

*Lat. 48°23′.8, Long. 122°34′.6: Charts 6380, 6300.

off the Hope Island shore. The bottom is rocky and very irregular, and numerous dangers marked by heavy kelp, lie between the channel and the Fidalgo Island shore. Southward of **Hunot Point** is an area used as an anchorage for pleasure craft during the summer months.

Seal Rocks lie about 1.4 miles southward of Hope Island, on the eastern side of the main channel in Skagit Bay. They are marked by a light shown from a white arm on post; the light is 20 feet above the water, and visible 5 miles.

Swinomish Slough connects the waters of Skagit Bay with those of Padilla Bay, 5 miles northward. The slough and its southern approach have been improved by the Government by dredging and by the construction of dikes. From deep water in Skagit Bay, the dredged channel leads northeastward along the northern side of **Goat Island,** which is rocky, steep, and timber covered; then continues past the southern point of Fidalgo Island and the western end of **McGlinn Island. Hole in the Wall** is the name used locally to refer to the narrow opening between McGlinn and Fidalgo Islands, through which the dredged channel connects with Swinomish Slough. The channel is marked by a number of lights and beacons, including lights at the western end of each of the entrance jetties. The channel has a project depth of 12 feet from Skagit Bay to deep water in Padilla Bay; in January 1940, the controlling depth was 12 feet. † In _____ 19 ____, the controlling depth in the channel was: _____feet. Swinomish Slough is crossed by a bridge at La Conner with a horizontal clearance of 100 feet. At the entrance to Padilla Bay, there are a railroad and a highway bridge with horizontal openings of 94 and 104 feet, respectively. The signal for opening all of these bridges is 4 long blasts. Most of the yachts going between Bellingham and Seattle, use Swinomish Slough in preference to Deception Pass because of the weaker currents and shorter run. The slough is used extensively for towing logs.

La Conner, near the southern end of Swinomish Slough, is the center of a rich agricultural district. It has wharves with depths of 4 to 14 feet. A limited amount of provisions can be obtained. There is a small marine railway capable of handling boats up to 65 feet in length.

Ika Island, 410 feet high, lying 0.6 mile eastward of Goat Island, is heavily wooded, and on its southern and eastern sides, is characterized by weathered cliffs rising from the highwater line. Pilings, the remains of a wooden dike, extend between Goat and Ika Islands. Two breaks in this dike permit passage into the waters leading to the North Fork of the Skagit River and to **Sullivan Slough.** The main channel passes the easterly opening.

GUEMES CHANNEL AND FIDALGO BAY

(CHART 6377)

Guemes Channel, separating **Guemes Island** on the north and Fidalgo Island on the south, leads eastward from Rosario Strait to Padilla Bay. The channel, which is about 3 miles long and 0.5 mile wide at its narrowest point, has depths of 7 to 18 fathoms.

Shannon Point, the southern point at the western entrance to Guemes Channel, is low and rounding; a rocky shoal, marked by a buoy at its northern extremity, extends 200 yards northward from the point.

The commanding officer of a United States battleship reports that the velocity of the currents in Guemes Channel exceeds 5 knots at times, and that during the flood

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

current there is an eddy between the eastern end of Guemes Island and Capsante, with an outgoing current along the northern shore of Fidalgo Island extending out about 200 yards into the channel from the shore.

Current predictions for this channel may be obtained from data given in the *Pacific Coast Current Tables*. During periods of strong currents, vessels anchoring in the channel should guard against dragging anchor, as the holding ground is poor.

Ship Harbor is a bight close eastward of Shannon Point, at the western entrance to Guemes Channel. Several canneries are located here and there are wharves built out to deep water, where large steamers load.

City of Seattle Rock, with 1½ fathoms over it, lies 200 yards offshore on the southern side of the channel, about 2 miles eastward of Shannon Point.

Anacortes, on the southern shore of Guemes Channel, is a thriving town and a port of entry. It is the center of an extensive salmon-canning industry, and canneries with wharves built out to depths of 12 to 20 feet, line the southern shore of the channel from Ship Harbor to Fidalgo Bay. A large fertilizer factory, and several large sawmills are located here. The commerce of the port also includes logs, lumber, wood pulp, shingles, salmon, fertilizer, and farm produce.

The port is incorporated as the **Port of Anacortes.** There are two wharves that can accommodate deep-sea vessels; the port wharf at the foot of Commercial Street, and a lumber wharf 200 yards to the eastward. Both these wharves have a depth of 30 feet alongside. There is an electric fog siren on the port wharf.

Capsante Waterway, leading to the eastern water front of Anacortes, is marked by a lighted range and four buoys. In June 1939, the controlling depth on the range in the dredged channel was 12 feet. †In _____ 19 ____, the controlling depth in the channel was: _____feet. At the inner end of Capsante Waterway is a small-boat harbor with a capacity of about 70 boats.

Pilots may be obtained through the Puget Sound Pilots' Association, Seattle.

Towboats.—Several local towboats are available.

Quarantine.—Vessels subject to quarantine inspection are given this inspection at Port Angeles. If vessels require fumigation after discharging cargo at Anacortes, this service is performed at the port. Advance notice should be given the senior surgeon of the Public Health Service of Seattle.

Customs.—Anacortes is a port of entry in charge of a deputy collector. The customs office is located in the Post Office on Commercial Street. There is a sub-office at the International Ferry Landing on First Street between N and O Streets.

Immigration.—The immigration office is in the Post Office. There is a sub-office at the International Ferry Landing.

Marine hospital.—The Public Health Service maintains a medical relief station and a contract hospital.

Anchorage may be had off the wharves in 6 to 12 fathoms. During periods of strong current, vessels at anchor in the channel should guard against dragging as the holding ground is poor.

No **harbor regulations** are prescribed. There is a port manager in charge.

Supplies and repairs.—Fuel oils, water, coal, provisions, and ship chandler's stores can be obtained. There is a shipyard with a marine railway for hauling out fishing launches.

There is a **chart agency** of the U. S. Coast and Geodetic Survey situated here.

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

Communication is by daily steamers or rail, and by telegraph and telephone. Ferry service is maintained to Guemes Island and San Juan Archipelago, and during the summer season to Sidney, Vancouver Island.

Fidalgo Bay, a shallow arm of Padilla Bay, extends southward from the eastern end of Guemes Channel. A shallow channel leads through the flat toward the head of the bay.

Padilla Bay (Chart 6380) lies between the mainland and the northern part of Fidalgo Island. The bay is largely occupied by drying flats, but deep water lies eastward of Capsante and Guemes Island. Entrance to the bay may be had from Rosario Strait through Guemes Channel; a passage eastward of Guemes Island leads into Padilla Bay from the northward.

William Point, about 100 feet high, is the western point of **Samish Island,** which forms the northern side of Padilla Bay. The point is wooded and, because of the low land eastward of it, appears as an island. The western extremity of the point is marked by **William Point Light,** shown from a small white house; the light is 30 feet above water, and visible 7 miles.

Jack Island, on the western side of the bay lies about 1.4 miles east-southeastward of Clark Point, the northern extremity of Guemes Island.

South-southwestward of Jack Island a shoal with depths less than 3 fathoms extends about 700 yards off the northeastern side of Guemes Island. From William Point, flats and shoals extend southward to **Saddlebag, Dot,** and **Hat Islands,** which lie eastward of Guemes Island, and on the edge of the flat extending from the eastern side of Padilla Bay.

Huckleberry Island, small and low, lies nearly in midchannel between Guemes and Saddlebag Islands.

March Point, low and wooded, lies on the southern shore of the Bay. **March Point Light,*** shown from a black pile dolphin, serves as a leading mark for the channel eastward of Guemes Island. The light is 15 feet above the water, and visible 7 miles. There is a dredged channel, marked by lights and beacons, across the flats eastward of March Point, which leads to Swinomish Slough, described on page 297.

BELLINGHAM BAY AND APPROACHES

(CHART 6378)

Bellingham Channel, between Cypress and Guemes Islands, is the most direct and the one generally used by vessels proceeding to Bellingham Bay from the southward. The depths vary from 17 to 60 fathoms in midchannel. Between Cypress and Guemes and Sinclair Islands, the tidal currents have considerable velocity, but between Sinclair and Vendovi Islands, the velocity of the current is considerably less.

A shoal, marked by a buoy, fringes the yellow bluff, forming the southwestern side of Guemes Island.

Cypress Island Light is shown on the western side of Bellingham Channel from a white house on the eastern extremity of the island, which forms the northeastern side of **Deepwater Bay.** The light is 16 feet above water, and visible 8 miles.

Cone Islands, a group of five islets on the western side of Bellingham Channel, lie off the northeastern side of Cypress Island just northward of **Eagle Harbor.** The

*Lat. 48°30′.0, Long. 122°33′.4: Charts 6377, 6380, 6300.

easternmost, 70 feet high, is the largest of the Cone Islands. Foul ground extends about 300 yards westward of the northernmost islet.

Clark Point, on the eastern side of Bellingham Channel, is a steep bluff forming the northern point of Guemes Island. A reef extends about 300 yards northward from the point.

Vendovi Island about 1.8 miles northeastward of Clark Point, lies on the southeastern side of the southern approach to Bellingham Bay.

A shoal with a least depth of 4¼ fathoms lies about 700 yards southwestward of Vendovi Island and is marked on its western side by a buoy.

Deep-draft vessels approaching Bellingham Bay from the northward use the channel between Lummi and Sinclair Islands. With the exception of Viti Rocks and the dangers northward of Sinclair Island, this channel is free of danger. The fairway is deep and has a width of 1,200 yards at its narrowest part, between Viti Rocks and Carter Point, the southern extremity of Lummi Island.

Viti Rocks lie about 0.7 mile southwestward of Carter Point and extend about 500 yards northwestward. The northwesternmost rock is 35 feet high, 200 yards long, and 70 yards wide, and is marked by a light on its highest point. **Viti Rocks Light,** unwatched, is shown from a white framework on a square wooden house. The light is 45 feet above water, and visible 9 miles.

Hale Passage, separating Lummi Island from the mainland northeastward, is about 6 miles long and has an average width of about 0.8 mile. The depths vary from 2½ fathoms on the bar near the northwestern end to 20 fathoms in the southeastern end of the channel.

Lummi Point, on the southwestern side of Hale Passage, about 1.5 miles southeastward of **Point Migley,** the northwestern extremity of Lummi Island, is marked by **Lummi Point Light,*** unwatched, shown from a small white square structure. The light is 17 feet above the water, and visible 9 miles. There is a large building on Lummi Point northwestward of the light.

Lummi Bay, northward of the northwestern end of Hale Passage, indents the mainland between **Sandy Point,** about 2.2 miles northward of Point Migley and a point about 3.5 miles south-southeastward. The bay is almost completely filled with a drying flat.

Beach, a village with a post office, is situated on the western side of Hale Passage, about a mile southward of Lummi Point. At the village is a landing wharf built out to 10 feet. There is a ferry landing on the southwestern point of **Lummi Indian Reservation,** eastward of Lummi Point.

From **Point Frances** the northern point at the southeastern entrance of Hale Passage, a bank extends to Eliza Island. The depths range from 4½ fathoms to 1½ fathoms about midway between the point and the island. A buoy is moored close southward of the shoal. The end of the spit making southeastward from Point Frances is marked by buoys.

Bellingham Bay from William Point to the head, is about 12 miles long and 3 miles wide. Anchorage may be obtained almost anywhere in the bay; the depths, over the greater portion vary from 6 to 15 fathoms, mud bottom; however, due to the nature of the mud bottom, vessels are apt to drag anchor in heavy weather.

Samish Bay separated from Padilla Bay by Samish Island, with flats that bare for

*Lat. 48°44′.1, Long. 122°41′.2: Charts 6378, 6380, 6300.

a considerable distance at low water, constitutes the southeastern part of Bellingham Bay. It is of no commercial importance.

Chuckanut Bay, which indents the eastern shore, is a cove affording shelter to small vessels. There is a cannery, a stone quarry, and a yacht club located within it. **Chuckanut Island** and **Chuckanut Rock** lie close within the entrance.

The villages of **Lummi** and **Marietta** are near the mouth of the **Nooksack River** which empties in the northwestern part of Bellingham Bay. Extensive mud flats fill this corner of the Bay.

Eliza Island, low and partially wooded, lies 1 mile northeastward of Carter Point. On the northwestern side of the island is located a storage yard where fishboats and scows are hauled out for the winter. The island is fringed by a shoal, and in most places, the shores should not be approached within about 400 yards. A rock with a depth of 1 fathom, lies about 500 yards northward of the western extremity of the island.

Eliza Rock, off the southern end of Eliza Island, is marked by a light. **Eliza Rock Light** is shown from a white pyramidal house. The light is 21 feet above the water, and visible 9 miles. An electric bell operates continuously at the light.

Bellingham, a port of customs entry, is situated at the head of the bay on the eastern shore. Lumbering is the principal industry, but several fish canneries are situated at South Bellingham. There are a number of wharves built out from the northern and eastern shores with depths alongside of 18 to 35 feet.

The flats extending from the northern shore have been improved by dredging channels from the deep water in the bay to the pierhead line at the mouths of **Whatcom and Squalicum Creeks.** In June 1940, **Whatcom Waterway** had controlling depths of 26 feet in the outer 3,800 feet and 18 feet in the inner 1,300 feet; the project depths are 26 feet and 18 feet, respectively. †In_____19___, the controlling depths in the channel were_____

_____

In the **Squalicum Waterway** the project depth is 26 feet, and in June 1940, the project depth prevailed except for a 25 foot shoal just westward of the stone breakwater, and a 19 foot shoal in the inner southeasterly end of the waterway. †In_____ 19___, the controlling depths in the channel were:_____

_____

Whatcom Waterway is marked by a light placed at the eastern edge of the channel shown from the roof of the warehouse on the municipal wharf. The light is 35 feet above water; the fog signal is an electric siren.

Squalicum Waterway is marked by a lighted range, on a bearing of 35°.

Prominent Objects.—The tower of the Bellingham Hotel bears a red neon sign which shows up prominently when approaching at night. The tower is about 205 feet above the street level and the sign consists of the word HOTEL.

Post Point, on the eastern side of Bellingham Bay lies about 1.5 miles north-northwestward of the northern entrance point of Chuckanut Bay. A sandy spit, marked by a lighted buoy, extends about 450 yards from the point.

Starr Rock, with a depth of 1¼ fathoms, lies about 300 yards offshore, 0.7 mile southwestward of Whatcom Waterway Light; it is marked by a buoy. Vessels should not pass inside the rock.

Pilots may be obtained from the Puget Sound Pilots' Association, Seattle.

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

Towboats up to 1,000 horsepower are available in Bellingham.

Quarantine.—Vessels destined for Bellingham, which require quarantine inspection should secure this inspection at Port Angeles. Fumigation may be had at Bellingham by giving advance notice to the senior surgeon of the Public Health Service at Seattle.

Customs.—The customs office is located in the Federal Building, corner of Cromwell and Magnolia Streets.

Immigration.—The United States Immigration Service has an office in the Federal Building.

Marine Hospital.—The Public Health Service maintains a medical relief station and a contract hospital at Bellingham.

Anchorage.—Bellingham Bay is mostly mud bottom but the mud is a thin accumulation over hardpan and is not good holding ground in heavy weather.

Small-boat haven.—A haven for small boats is located at the inner end of Squalicum Waterway. It has a controlling depth of 14 feet.

Harbor regulations are prescribed for Bellingham Harbor, and are enforced by a harbor master. The limit of speed for vessels within 2,000 feet of the wharves is 6 miles an hour, and from 2,000 feet to 1 mile from the wharves it is 8 miles per hour. The discharging of ballast is prohibited in water less than 20 fathoms deep, and the discharging of garbage is prohibited within a mile of the outer harbor line.

Tides.—The mean range of the tide at Bellingham is 5.2 feet; the range between mean lower low water and mean higher high water is 8.6 feet. A range of about 14½ feet may occur at the time of maximum tides.

Facilities.—The hoisting facilities for heavy lifts are not generally available for public use. There is one grain elevator and several storage warehouses; the warehouse with cold storage facilities is located about a mile from the waterfront.

Supplies.—Provisions and ship chandler's stores may be obtained. Water can be had at the wharves and fuel oils at the oil docks. Bunker coal may be obtained.

There is a **chart agency** of the U. S. Coast and Geodetic Survey situated here.

Repairs.—Minor repairs to vessels can be effected. Marine railways are available for vessels up to 140 feet in length.

Communication is by steamer or rail, and by telegraph and telephone. During the summer season, there is an automobile ferry service from Bellingham to Sydney on Vancouver Island. The airport is situated about 1.5 miles northwestward of the city. Bellingham is on the Pacific Highway.

Port Series No. 28 covers the port of Bellingham.

Storm warnings are displayed by the Weather Bureau.

South Bellingham.—The cannery and exporting docks of the Pacific American Fisheries are located at South Bellingham.

DIRECTIONS, BELLINGHAM BAY

(CHART 6380)

To enter Bellingham Bay from southward through Bellingham Channel, the principal entrance, follow the directions for Rosario Strait, given on page 49, and continue the **028°** course for 0.65 mile past Burrows Island Light to a position with Fidalgo Head abeam, distant 0.8 mile. Then steer **033°** for 4 miles, passing a little over 0.3 mile off the point on the western side to a position in the middle of the strait, with Cypress Island Light in range with the easternmost Cone Island. Change to Chart 6378.

Then steer **004°** for 2.2 miles, passing 0.2 mile eastward of Cypress Island Light to a position with the easternmost Cone Island abeam, distant 0.5 mile. From here steer **044°** for 1.9 miles to a position 0.6 mile 270° from the western extremity of Vendovi Island, and then steer **058°** for 3.3 miles to a position 0.8 mile 90° from Eliza Rock Light.

From here a **014°** course for 4.3 miles will lead to a position 0.2 mile off Post Point bell buoy, and **036°** course for 2.2 miles additional will then lead westward of Starr Rock buoy and to the entrance of the dredged channel leading to Bellingham.

GEORGIA STRAIT (SOUTHERN PART)

(CHART 6300)

Georgia Strait, between the southeastern end of Vancouver Island and the mainland northeastward, extends about 115 miles northwestward from the convergence of Rosario Strait and the continuations of Haro Strait and San Juan Channel. In Georgia Strait, the general depths are great and in many places exceed 200 fathoms. Rosario Strait, Haro Strait, and San Juan Channel, are described on pages 291, 273, and 283 respectively.

Vessels bound to Georgia Strait from Puget Sound, should give the southern shore between Boundary and Active Passes a berth of at least 2 miles, because it is fringed with dangers. Point Roberts, see page 304, on the northern shore, affords an excellent landmark.

Tides.—During any 24 hours, when there are two obvious high waters, though their heights do not differ greatly, there are considerable differences in the heights of successive low waters.

Tidal Currents.—In Georgia Strait, the tidal currents are not nearly as strong as those in the channels leading to it from the Strait of Juan de Fuca. The currents in Georgia Strait attain a rate of 3 knots at times, particularly during the freshets of summer, when the Fraser River discharges a large volume of fresh water. This fresh water, which has a peculiar milky color, flows across the banks at the mouth of the river and almost directly toward Active Pass. Frequently this water extends entirely across the strait and at times reaches into the inner channels along the shore of Vancouver Island; at other times, it reaches only to the middle of the strait and forms a striking contrast with the deep blue water of Georgia Strait.

In the middle of the strait, northward of Patos and Saturna Islands, the rate of the current varies from 1 to 3 knots, seldom exceeding the latter. The rate is still less northwestward of the mouth of the Fraser River, where the width of the strait is about 15 miles. Southeastward of the mouth of this river, the tidal currents are slightly stronger off the southern shore than off the northern one; within a line joining Point Roberts and Sandy Point, the currents are scarcely felt and vessels can take advantage of this, especially since good anchorage can be obtained in this vicinity.

The tidal currents are stronger close to the southern shore which is swept by the rapid currents out of Active, Porlier, and Gabriola Passes. The south-going tidal current in Georgia Strait sets strongly southwestward into Active Pass.

SANDY POINT TO POINT WHITEHORN

(CHART 6380)

Between Sandy Point, described on page 300, and **Cherry Point,** about 4.5 miles north-northwestward, the shore of the mainland forms a bight in which there are no off-lying dangers.

Point Whitehorn, about 2.8 miles northwestward of Cherry Point, is a conspicuous, bold, bluff, about 150 feet high; its seaward face is a steep cliff of white clay.

POINT WHITEHORN TO VANCOUVER

(CHART 6300)

Birch Bay, on the eastern side of Georgia Strait, lies between **Point Whitehorn** and **Birch Point,** about 3 miles northwestward; it is an open bight, affording anchorage in 4 to 5 fathoms. It is open southward and westward, but affords some protection from northward. The bay is circular in shape and about 2 miles in extent. Flats, bare at low water, occupy a considerable area at the head of the bay. A number of resorts are situated along the shores of the bay.

The **International Boundary** between the United States and Canada is marked, where it crosses Boundary and Semiahmoo Bays, by range lights on skeleton steel towers with square slatted day marks. These lights are not intended for navigation. The **Peace Monument,** located on the boundary, is a masonry arch, facing north-and-south, about 28 feet above the ground, and painted an intense white. It is a distinctive landmark, as it stands alone and shows offshore against a background of dark trees.

Caution.—The attention of all mariners, especially those frequenting Puget Sound or Canadian waters, is called to the fact that the International Rules govern in Canadian waters.

Point Roberts is the prominent feature in approaching from either northward or southward. The eastern face is about 180 feet high and is composed of white, vertical bluffs. The point is well wooded, and owing to the low land behind it, is usually made as an island, especially from southward. The southwestern extremity of the point is marked by **Point Roberts Light,*** shown from a white skeleton tower. The light is 31 feet above water, and visible 11 miles. Vessels should keep southward of a line extending 5 miles 112½° from Point Roberts Light and eastward of meridian 122°58′ to avoid fish traps. They should also avoid a fish-trap area about 1 mile square, the northeast corner of which is 3 miles 234° true from Semiahmoo Harbor Light.

Temporary anchorage may be obtained westward of Point Roberts in a depth of 8 fathoms, good holding ground, about 1 mile 321° from Point Roberts Light. The position is about 0.3 mile from the edge of **Roberts Bank** and vessels should anchor no farther northward.

Semiahmoo Bay (Chart 6399) has its entrance between Birch Point and Kwomais Point, about 5 miles north-northwestward. It is funnel-shaped and is connected, at its eastern end, by a narrow channel with Drayton Harbor. The eastern part of the bay is shoal. Anchorage may be had in the bay in 5 to 9 fathoms, but is exposed southward and westward.

Drayton Harbor is a small basin-like cove formed by **Semiahmoo Spit,** the extension of a sand spit northward of Birch Point. It is about 2 miles in extent, but flats bare at low water, occupy a large area in the eastern and southern parts of the harbor. Anchorage within the 18-foot curve is limited to a small area just within the entrance; farther in there is ample anchorage space for small craft in depths of 9 to 18 feet. The harbor is not a good anchorage in stormy weather.

Semiahmoo Harbor Light, shown from a white octagonal frame dwelling on piles, is situated near the northern extremity of the extensive sand flats that extend off the

*Lat. 48°58′.3, Long. 123°04′.9: Chart 6300.

northwestern side of Semiahmoo Spit. The light is 48 feet above water, and visible 12 miles. A fog signal is sounded on an electric bell.

A buoy marking the western edge of the sand flats is moored about 700 yards southwestward of the light.

The channel from Semiahmoo Bay into Drayton Harbor has a controlling depth of 28 feet. There is a 16-foot spot about 200 yards northward of the cannery wharf on Semiahmoo Spit; in entering Drayton Harbor, vessels should favor the southern side of the channel.

California Creek, entering the southeastern part of the harbor, has its entrance barred by a fixed highway bridge having a horizontal clearance of 10 feet and a vertical clearance of 5 feet at MHW; the entrance to this creek may be reached only at high water with shallow draft boats.

Dakota Creek may be entered at high water by boats drawing not more than 3 feet as far as the second bridge; the second bridge is the head of navigation which is 0.5 mile above the mouth. The first bridge across Dakota Creek has a horizontal clearance of 57 feet and a vertical clearance of 18 feet at MHW; the second bridge has a horizontal clearance of 26 feet and a vertical clearance of 15 feet at MHW.

In the harbor, there is a large low water area which is to be avoided even at high tide. Numerous piles, wreckage, and dumps make high water navigation hazardous even with a shallow draft boat. There are many boulders between the low water and high water lines.

Blaine is situated near the entrance on the northern shore of Drayton Harbor. Blaine City Wharf with a reported depth of 40 feet along its face is the only wharf on the northeastern shore of the harbor. Several buildings and a cannery, constituting the town of **Semiahmoo,** are at the northern end of the sand spit. A depth of 30 feet has been reported at the large cannery wharf. Lumbering and fishing are the principal industries. Provisions are obtainable but only a small quantity of coal is available. Water may be obtained at the cannery wharves.

Pilotage is advisable, especially for deep-draft vessels. A pilot can usually be obtained from the canneries or sawmills.

To enter Drayton Harbor from Semiahmoo Bay pass about 300 yards northward of Semiahmoo Harbor Light, and steer a course about midway between the cannery wharves and the yacht basin. After reaching the cannery wharves favor the northern side of the channel to avoid the spit east-southeastward of the cannery, and anchor as convenient.

The depths in Drayton Harbor and its entrance are subject to change hence the charted data should be verified.

Communication is had by rail and coastwise steamers; there are also telephone and telegraph facilities. The United States-Canadian boundary line passes through the northern edge of Blaine; the Pacific Highway, providing freight and bus service, passes through the town.

Storm warnings are displayed by the Weather Bureau from a steel tower near the water front in Blaine.

Boundary Bay, indents the mainland between **Kwomais Point,** the northern entrance point of Semiahmoo Bay, and Point Roberts. The greater portion of the bay is filled with flats, bare at low water; in the northeastern part of the bay the flats are intersected by narrow, shallow channels leading to the **Nicomekl** and **Serpentine Rivers.**

Except for **English Bluff,** about 1.5 miles northward of **Boundary Bluff,** the coast northward to Point Grey, is low, featureless, and barely discernible from Georgia Strait.

Roberts Bank and **Sturgeon Bank** are formed by the alluvial deposits of the Fraser River. The former, extending northwestward of Point Roberts, is southward of the river channel and the latter, extending southwestward of Point Grey, northward of it. These banks dry in patches and in places extend 4.5 miles offshore. They are steep-to; soundings of 50 fathoms will be found very close to the edge of the bank. Vessels working along the edge of Roberts Bank should not bring the southern extremity of Point Roberts or the edge of the high trees immediately within it to bear more than 114°. A buoy marks the entrance to the channel leading through Roberts Bank to Canoe Pass, described on page 307.

The **Fraser River** enters Georgia Strait about 10 miles northwestward of Point Roberts. The river is joined by the **Coquitlan** and **Pitt Rivers** about 3.5 and 5 miles, respectively, above New Westminster. The **Harrison River** joins the Fraser River about 60 miles above the mouth.

The least depth in the channel from the Strait of Georgia to New Westminster, on the northern bank about 20 miles up the river was 21 feet in 1938; between New Westminster and **Port Mann,** about 3 miles eastward, the least depth was 23 feet.

The river is at its lowest level during January, February, and March. It begins to rise in April with a more rapid rise in May and reaches its highest level about the end of June. The river begins to subside between the middle and end of August, and in September the current is not inconveniently strong. September, October, and November are favorable for the navigation of the river, as the water is then sufficiently high for vessels to reach **Hope,** 80 miles above the mouth, and the strength of the current has considerably abated.

Caution.—The channels in the Fraser River are constantly changing and the aids to navigation which mark them are moved accordingly.

Pilotage is compulsory between Sand Heads and the mouth of the Pitt River. Elsewhere in Fraser River local knowledge is advisable. Pilots can be obtained from New Westminster, and they usually meet vessels about a mile seaward of Sand Heads Lightship.

Towboats are available at New Westminster.

The main entrance to the Fraser River is between Sand Head Lightship and the lighted whistle buoy about 1.5 miles southward; thence this entrance leads between Sturgeon Bank on the north and Roberts Bank on the south.

The channel entrance is protected on its northern side by **Steveston Jetty,** built along the southern edge of Sturgeon Bank, extending about 1.2 miles west-northwestward and thence 3.5 miles west-southwestward from Garry Point. There is a light on a pile dolphin at the end of the jetty.

Sand Heads Lightship* has a red hull with SAND HEADS NO. 16 in white on forward bulwarks, 2 masts. The light, shown from the mainmast, is 40 feet above water, and visible 11 miles. A fog signal is sounded on a tyfon horn. A lighted whistle buoy is moored on the southern side of the entrance channel about 1.5 miles southward of the lightship.

Steveston on **Lulu Island** about 0.5 mile eastward of **Garry Point,** the northern entrance point to Fraser River, extends along the bank of the river about one mile. There are extensive canneries and wharves situated here; large vessels can lie alongside the wharves at all stages of tide. Small quantities of gasoline and diesel oil are available.

There are a number of islands in the mouth of the Fraser River.

*Lat. 49°06′.2, Long. 123°18′.7: Chart 6300.

Canoe Pass is a narrow channel about 3 miles southeastward of **Pelly Point**, the southern entrance point of Fraser River. Light-draft vessels with local knowledge use the narrow and intricate channel from Canoe Pass through Roberts Bank to Georgia Strait. There is a swing bridge across the northeastern end of Canoe Pass.

The tidal currents in the Fraser River are affected by the weather in Georgia Strait, the rains, and the amount of water in the river. In the channel above Garry Point during the freshets, the flow, which may be checked by the rise of the tide, is almost continuously toward the mouth of the river. During the freshets the greatest rate occurs 2 to 3 hours before low water and may amount to 5½ knots. After the freshets are over, the greatest rate occurs on the average about 1½ hours before low water and is reduced to 3 or 4 knots. During the low stage of the river, there is a flood and ebb on all the larger tides; the flood begins soon after high water and commences first along the bottom.

At New Westminster, the flood current is unable to reverse the river current except in the autumn months.

At New Westminster the river is very seldom frozen over; loose pieces of ice, which do no damage to shipping, occasionally come down the river.

New Westminster is located on the northern bank about 20 miles above the entrance. Several canneries and sawmills are situated here and a conspicuous grain elevator stands about a mile below the town. A large cold-storage plant is available. The wharves have depths of 27 to 34 feet alongside; most of the wharves have warehouses and sheds and many have railroad tracks. Extensive engine repairs and minor hull repairs can be effected. Supplies of all kinds are available; small quantities of coal, diesel oil and fuel oil are available.

North Arm is entered by a channel, dredged for a width of 300 feet and a depth of 10 feet, heading from Georgia Strait about 0.5 mile southwestward of Point Grey. North Arm, under the name of **North Fraser Harbor,** has been developed for sawmilling and other purposes. It is spanned by several swing bridges.

A jetty, which forms the southern side of the western entrance channel to North Arm, extends about 3 miles northwestward of **Iona Island,** which is located on the southern side of the entrance proper of North Arm. Navigational aids mark this channel.

Middle Arm is a branch of North Arm and is separated from the western end of North Arm by **Sea Island.**

Point Grey, the southern entrance point of **Burrard Inlet,** is a rounded bluff forming the western termination of a wooded promontory. The point is very conspicuous from southward. On the high land above the point are the conspicuous buildings of the University of British Columbia.

The 6-fathom curve lies about a mile offshore, and depths of 3 fathoms lie about 0.5 mile northwestward of Grey Point.

A lighted bell buoy is moored about 1.2 miles northward of Point Grey.

Point Atkinson, the northern entrance point of Burrard Inlet, is comparatively steep-to; however, a rock which dries 5 feet, lies 100 yards off shore about 700 yards northeastward of the point, and a rock awash lies about 500 yards northeastward of the point. **Point Atkinson Light** is shown from a white hexagonal tower, with six buttresses, surmounted by a red cylindrical lantern. The light is 108 feet above water, and visible 16 miles. The fog signal is sounded on an air diaphone. There is a radiobeacon equipped for distance finding.

Tide rips occur frequently off Point Atkinson, caused by the meeting of the tidal currents from Burrard Inlet and Howe Sound.

Spanish Bank extends about 1,200 yards northward from the western half of the promontory terminating in Point Grey. The bank, which dries, is composed of hard sand, is steep-to, and its position is indicated by a ripple during strong westerly winds at or near low water. On its northern edge, about 1.5 miles northeastward of Point Grey, is a heap of boulders which dries 6 feet. The bank is steep-to and its position is indicated only by a ripple during strong westerly winds, and then only at or near low water.

Measured Distance.—Two pairs of beacons, consisting of large triangles on posts are situated on Spanish Bank and mark a measured distance of 6,077 feet; the courses for this distance are 90° and 270°.

English Bay, on the southern shore of Burrard Islet, lies immediately within the entrance eastward of Point Grey. The depths in the bay decrease regularly from the 10-fathom curve, but northward of the bay a deep channel has been scoured by the discharge through First Narrows from the upper portion of Vancouver Island. A rocky shoal fringes the western side of Stanley Park Peninsula. **False Creek** enters the southeastern part of the bay.

From Point Atkinson to **Reardon Point,** about 4 miles eastward, the northern shore of Burrard Inlet is indented by **Caulfield, Claymore, Ettershank,** and **Patterson Coves.**

Vancouver Harbor includes all the tidal waters in Burrard Inlet eastward of a line drawn from Point Grey to Point Atkinson. A secure harbor, available to the largest vessels afloat is formed between First and Second Narrows, and on its southern shore is the city of **Vancouver,** the third largest city of Canada and the commercial metropolis of British Columbia.

The three principal anchorages in Vancouver Harbor are English Bay, the outer anchorage; Vancouver within First Narrows; and **Port Moody,** at the head of the eastern arm of Burrard Inlet.

The general depths in First Narrows are 5¼ to 12 fathoms; the fairway has been swept to a depth of 32 feet.

In the First Narrows the ingoing current, which sets southeastward, has an average maximum velocity of 6.0 knots and at times attains a velocity of 8.1 knots. In the narrowest part of the channel, the rate of the tidal current varies greatly. The duration of slack water varies and is sometimes considerable. Further details of the tidal currents in the vicinity of Vancouver Harbor are published by the U. S. Coast and Geodetic Survey in the *Current Tables, Pacific Coast.*

First Narrows is formed between the northern part of the **Stanley Park Peninsula** and a flat extending 200 to 600 yards off the mouth of the **Capilano River.** Off Prospect Point, the northern extremity of the Stanley Park Peninsula, the channel is not more than 300 yards wide.

From a distance seaward, the entrance to First Narrows is difficult to identify without local knowledge. The twin spires of a church about 1.8 miles southeastward of Reardon Point are prominent.

Prospect Point is a high bluff on the southern side of First Narrows.

A **signal station** is located on the bluff on Prospect Point and vessels may communicate with the station by any form of visual signaling. Signals to warn mariners of the presence of other vessels in First Narrows are displayed from the yardarms of the signal mast. From seaward the signals are visible from all directions, and the signals are visible to out-bound vessels immediately after they round Brockton Point. One black ball, on the southern yardarm, indicates one or more in-bound vessels; two black balls, horizontally placed, indicate one or more in-bound vessels with tows. At night the balls

are replaced by white lights. One red cone with the point up, on the northern yardarm, indicates one or more out-bound vessels; two red cones, points up, placed horizontally indicate one or more out-bound vessels with tows. At night the cones are replaced by red lights. A cone, point down, over a cone, point up, indicates the fairway is obstructed; at night a red flare indicates the fairway is obstructed.

Prospect Point Light* is shown from a white square wooden tower with a red roof located under the bluff. The light is 28 feet above the water, and visible 10 miles.

The flat delta at the mouth of Capilano River on the northern side of First Narrows, is steep-to and dries about 12 feet; it is composed of shingle and boulders. Two lighted beacons are on the northern side of the channel. The **First Narrows Beacon** which is situated near the edge of the flat on the northern side of the channel, is shown from a white rectangular wooden building on concrete base with a dwelling attached on pile foundation. The light is 25 feet above water, and visible 10 miles; the fog signal is an air diaphone. The **First Narrows Inner Beacon** is shown from a lantern and tank on pile dolphin. The light is 12 feet above the water, and visible 7 miles; the fog signal is an air horn.

Between Prospect and Brockton Points the southern shore of the channel is fringed with drying ledges that extend as far as 150 yards offshore.

A suspension bridge, with a vertical clearance of 200 feet at MHW, crosses First Narrows close eastward of Prospect Point.

Pilotage is not compulsory, but pilots are available.

EAST POINT TO ACTIVE PASS

(CHART 6380)

The coast between East Point and Active Pass should be given a berth of at least 2 miles as it is fringed with dangers. At night, the lights on Georgina and East Points are obscured over these dangers. East Point, Rosenfelt Rock, and Tumbo Island are described on pages 279, 280, and 280 respectively.

Belle Chain Islets, a narrow rocky ridge lying parallel with several islets and drying rocks along the northern shore of **Samuel Island,** extend about 2 miles northwestward from about 1,300 yards northwestward of **Winter Point,** the northern point of Saturna Island. The largest islet, 34 feet high with a few trees on it, is near the southeastern extremity of the ridge. About 800 yards within the northwestern extremity of the ridge, there is a rock 3 feet high.

Edith Point, the northeastern extremity of Mayne Island, lies almost 3.5 miles northwestward of Winter Point. Foul ground, with a depth of 5 fathoms at its outer end, extends about 0.3 mile southeastward from Edith Point.

A rocky patch with two heads, each of which has a depth of 4 feet, lies about midway between Edith Point and the northwestern end of Belle Chain Islets. Between this patch and the northwestern end of Belle Chain Islets are some 5 fathom patches.

Campbell Bay on the eastern side of Mayne Island lies between Edith Point and **Campbell Point.** A rock which dries 11 feet, is located about 100 yards offshore and 0.2 miles within Edith Point, but elsewhere the bay is free of danger. A good temporary anchorage, open to the southeastward, can be had in 12 fathoms, mud bottom, about 800 yards from the head of the bay and about 100 yards southward of an islet, 3 feet high. Vessels entering the bay should round Edith Point at a distance of about

*Lat. 49°18′.6, Long. 123°08′.4: Chart 6300.

800 yards by steering for Campbell Point bearing 217°, thus passing between the foul ground off Edith Point and the rocky patch with two heads farther southward.

ACTIVE PASS TO BALLENAS ISLAND

(CHART 6300)

Active Pass is described on page 282.

Salamanca Point on the southeastern side of **Galiano Island** is conspicuous from both southeastward and northwestward. The point is rocky and the trees on it grow down nearly to the high water mark.

Between Salamanca Point and the entrance to Porlier Pass, about 12 miles northwestward, the southern shore of the Georgia Strait is formed by the northeastern shore of Galiano Island which may be approached safely to a distance of 0.5 mile.

Porlier Pass separates Galiano and Valdes Islands and connects Trincomali Channel to Georgia Strait. The pass has a minimum width of about 800 yards, but the navigable channel is narrow and the tidal currents run with considerable strength. It is advisable to employ a pilot on the first visit to this pass.

Porlier Pass Range, Front Light,* on **Race Point,** Galiano Island, is shown from a white square wooden tower with a red, octagonal lantern. The light is 21 feet above water, and visible 9 miles.

Porlier Pass Range, Rear Light, on **Virago Point,** is shown from a white square wooden tower with red lantern, situated 400 yards 196° from the front light. The light is 32 feet above water, visible 10 miles.

Porlier Pass bell buoy is moored close eastward of the shoals and rocks on the western side of the northern approach to Porlier Pass.

Gabriola Pass lies between the northwestern end of Valdes Island and Gabriola Island, connecting the northwestern end of **Pylades Channel** to Georgia Strait. This pass, being narrow and intricate and having many dangers on its eastern approach is not recommended for general navigation and should be used only by those with local knowledge.

Gabriola Reefs, a dangerous group of rocks, extend from about a mile east-northeastward to about 2 miles northeastward of the southern point of **Breakwater Island** which is located at the entrance to Gabriola Pass. On the reef are some rocks that dry 3 to 7 feet, but the northernmost and southernmost dangers have depths of 3 fathoms.

Thrasher Rock, a detached steep-to rock that dries 1½ feet, is located about 400 yards eastward of the northern end of Gabriola Reefs and about 2 miles northeastward of the southern extremity of Breakwater Island. A rocky 5-fathom patch lies about 400 yards northeastward of the rock.

Gabriola Reefs Light situated on Thrasher Rock, is shown from a black pyramidal skeleton tower on cylindrical tank with a square stone base. The light is 30 feet above water, and visible 10 miles.

Notch Hill, described on page 312, bearing less than 287° and open northward of Berry Point clears Gabriola Reefs and leads northward of Gabriola Reefs and Thrasher Rock.

Flat Top Islands, northward of Breakwater Island, lie close off the eastern point of Gabriola Island.

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*Lat. 49°00′.8, Long. 123°35′.1: Chart 6300.

Berry Point is the northeastern point of Gabriola Island. The northern shore of the island is thickly wooded and apparently bold; it has not been thoroughly surveyed and should not be approached within 0.8 mile.

Entrance Island, about 0.5 mile northeastward of Berry Point, is a sandstone rock, 30 feet high, bare of trees but some vegetation grows on it. **Entrance Island Light** is shown from a white square wooden tower with a dwelling attached. The light is 65 feet above water, and visible 14 miles. The fog signal is sounded on an air diaphone. Storm signals are shown from the lighthouse. Rocky patches, with depths of 7 to 8 fathoms, lie within 1.8 miles eastward of the island; the patches are surrounded by deep water. Vessels without local knowledge should pass outside Entrance Island and not through **Forwood Channel** between the island and Berry Point which is used by local steamers.

Sailing vessels working through Georgia Strait at night should keep Entrance Island Light in sight; the light is obscured when bearing more than 301°.

Tinson Point, about 1.5 miles westward of Berry Point, is the northeastern extremity of a small peninsula at the northwestern end of Gabriola Island. From the western end of the peninsula, kelp-covered reefs with depths of 1 to 5 fathoms extend about 600 yards northwestward.

Snake Island, a smooth-topped, grassy island, 35 feet high, lies about 1.8 miles northwestward of Tinson Point. Several rocks above water and others that dry are located on reefs extending about 200 yards northward, eastward, and southward and about 100 yards westward. A rocky ledge, marked by a bell buoy and usually by kelp, extends about 400 yards southward from about 0.2 mile southeastward of the southern point of Snake Island. A rock with a least depth of 6 feet is on this ledge.

Fairway Channel, the easternmost of the channels in the northern approach to Nanaimo, leads between Snake Island and Tinson Point. The channel is deep and has a navigable width of 0.8 mile.

Five Finger Island, 40 feet high, a bare rugged island with five hummocks resembling the knuckles of a closed hand, lies about 1.2 miles northwestward of Snake Island. Foul ground fringes the island on all sides and extends about 250 yards southward of it. A detached 3-fathom patch lies about 0.3 mile westward of the island.

West Rocks, five small islets 4 to 37 feet high, lie between 800 and 1,200 yards southwestward of Five Finger Island. Reefs surround West Rocks and in places extend about 200 yards from them. **West Rocks Light** is shown from a red pyramidal skeleton tower with a cylindrical base on a skeleton base on the summit of the southwestern islet. The light is 30 feet above water, and visible 10 miles. A detached 3-fathom patch lies about 350 yards east-northeastward of the southernmost of the West Rocks.

Middle Channel leads between Snake Island on the east and Five Finger Island and West Rocks on the west; this channel is deep and over a mile wide.

Horswell Channel, the westernmost of the channels in the northern approach at Nanaimo leads between West Rocks and the Vancouver Island shore; the fairway is deep and almost 0.5 mile wide.

Clarke Rock lies on the western side of Horswell Channel. The rock dries 4 feet and is marked by a white beacon, 15 feet high.

Horswell Bluff forms the southern point of the western side of Horswell Point. Foul ground extends about 600 yards east-southeastward from the bluff. A buoy is moored about 200 yards east-southeastward of the extremity of the foul ground.

Newcastle Island, 377 feet high, lies on the western side of the northern approach of Nanaimo and about a mile southward of Horswell Bluff. The shores of the island are rocky. A detached 3-fathom patch lies about 1,100 yards east-southeastward of **McKay Point,** the northeastern extremity of the island.

Protection Island lies with **Batchelor Point,** its northeastward extremity, about a mile south-southeastward of McKay Point. With the exception of its northern and southern extremities, the island is thickly wooded with the tops of the trees on its summit reaching a height of about 200 feet; on the southern part of the island are some buildings connected with a coal mine.

Nanaimo Harbor is entered between **Gallows Point** and the drying mud flats westward of **Jack Point;** the flats form the southern side of the harbor. Good anchorage can be had in 5½ fathoms.

Nanaimo is the coal mining center of Vancouver Island and is a port of entry. Pilots are available and will meet vessels outside by arrangement. Wharves have depths up to 31 feet alongside. Supplies of all kinds are available. Foundry and machine shops are available for hull and engine repairs.

Neck Point, about 2 miles westward of Five Fingers Island, at the northwestern entrance point of **Hammond Bay,** is fringed with foul ground that extends almost 200 yards offshore; on this foul ground there are three islets, of which the highest, 19 feet, is the southernmost.

The coast of Vancouver Island from Neck Point trends westward for 3 miles to **Icarus Point,** with **Blunden Point** 2 miles beyond and on the southern side of the entrance to Nanoose Harbor. The coast is fairly steep-to, the 10-fathom curve being charted 500 yards offshore; it has not been closely surveyed.

Nanoose Harbor, about 8 miles, northwestward of Nanaimo, is easily recognized by **Notch Hill** on the northern side of the harbor. The hill appears as a double or notched peak from the southward; the northeastern peak has an elevation of 799 feet, but the trees on it increase the height to 854 feet. The southwestern peak has an elevation of 716 feet. The trend of the harbor is east and west and it is about 2 miles long with an average width of about 1,500 yards; the head is low and swampy. It is available for all classes of vessels; there are depths of 12 to 16 fathoms in the entrance.

Between Wallis Point, the northern entrance point of Nanoose Harbor, and **Dorcas Point,** about 4 miles northwestward, the shore is fronted by several islands and numerous islets, rocks, and shoals, lying in the northern approach to Nanoose Harbor. No vessel without local knowledge should attempt to pass between them or between any of them and the shore.

Maude Island, about 0.8 mile eastward of Wallis Point, forms the northern side of the approach to Nanoose Harbor. The island is wooded and 119 feet high to the tops of the trees. **Maude Island Light*** is shown from a white pole with a concrete base on the southern side of the island. The light is 25 feet above water. A detached bare islet, 11 feet high, lies 75 yards off the western extremity of Maude Island and a rock drying 2 feet lies 125 yards southward of the same extremity; foul ground extends 75 yards eastward and westward of the latter rock. The eastern point of the island is foul for 100 yards southward.

Edgell Banks are located 1,500 yards eastward of Maude Island, and consist of four separate shoals, the three eastern of which have least depths of 8, 9, and 10 fathoms,

*Lat. 49°15′.9, Long. 124°04′.6: Chart 6300.

respectively; the western one has a least depth of 4½ fathoms. The latter shoal is 1,200 yards east-northeastward of the eastern extremity of Maude Island.

Winchelsea Islands, the outermost of those to the northward of Nanoose Harbor, are five islands lying close together about 1.3 miles northward of Maude Island. The westernmost of the group, 84 feet high, is the highest, but the easternmost island, 79 feet high, is the largest. All these islands are covered with grass and on them are a few stunted trees.

Gray Rock, 2 feet high, is a small gray rock located about 0.2 mile eastward of the southern end of the Winchelsea Islands. **Rudder Rock,** about 400 yards south-southeastward of Gray Rock, having a depth of 6 feet, is the head of a shoal which has depths of less than 10 fathoms and is not marked by kelp.

Yeo, Douglas, and **Gerald Islands,** with **Amelia Island** between them and the shore, lie between 2 and 3 miles northwestward of Winchelsea Islands. In the vicinity of these islands there is much foul ground, and no vessel without local knowledge should attempt to pass between them, or between any of them and the shore.

Ballenas Islands, two islands lying on the southern side of Georgia Strait, are located with their southern extremity about 2 miles northeastward of Dorcas Point. The northern island is about 250 feet high and has only two or three trees on it; its summit terminates in a sharp, bare nipple on which stands an old lighthouse, 33 feet high, consisting of a white square wooden tower with a red lantern. The southern island is wooded and 175 feet high. They have the appearance of being one island when seen from any direction, being separated only by a narrow passage which, at the eastern entrance, is less than 200 yards wide. The western end of this channel is almost closed, and there is no passage into it from that direction.

The islands are steep-to and bold on all seaward sides, except for a rocky shoal with a depth of 4 fathoms, lying 450 yards off the southeastern extremity of the southern island.

Ballenas Islands Light is shown from a white octagonal concrete tower with a red octagonal lantern located on the northern point of North Ballenas Island. The light is 70 feet above water, and visible 14 miles. The light is visible from 40° to 307°. A fog signal is sounded on an air diaphone.

Ballenas Channel is not less than 0.7 mile wide in the fairway. Steamers and coasting vessels may take this channel, but it should not be used without local knowledge.

Halibut Bank, about 18 miles easterly of Ballenas Island Light, consists of two parts; the southeastern and smaller part has a least depth of 15 fathoms, and the northwestern part has a least depth of 12 fathoms, hard sand and stones.

Chapter 17.—ADMIRALTY INLET AND PUGET SOUND TO SEATTLE

(CHART 6450)

Puget Sound (Charts 6450 and 6460) extends about 53 miles in a general southerly direction from Point Wilson and then turns southwestward for about 30 miles, expanding into numerous inlets and passages, the majority of which are navigable by deep-draft vessels. The northern portion of the sound, from Point Wilson to Foulweather Bluff is known as Admiralty Inlet.

This chapter describes Admiralty Inlet, Possession Sound and Saratoga Passage, Puget Sound to Seattle, and includes the various inlets and passages within that area. Puget Sound, from Seattle to Olympia is described in the following chapter.

Navigation of this area is easy in clear weather and the chart is an excellent guide. The outlying dangers are few and marked by aids, and generally a mid-channel course can be followed with safety. The currents follow the general direction of the channels and have considerable velocity; see also Currents, following. In thick weather, vessels with local knowledge depend upon the echo from the whistle in navigating these waters, but owing to the uncertainty of the currents and the great depth which render the lead useless in many places strangers are advised to take a pilot.

The large tides of Puget Sound are very complex and variable, and the use of the *Tide Tables for the Pacific Ocean*, which give the daily time and height of every high and low water for the principal ports, is advised.

Currents.—Daily predictions of the times of slack water and the times and velocities of strength of current in Admiralty Inlet together with factors and differences for obtaining the times and velocities of the current for other points in Puget Sound are given in the *Pacific Coast Current Tables*.

In Admiralty Inlet and Puget Sound, the tidal currents are subject to daily inequalities similar to those of the tides. Velocities of 2 to 5 knots occur from Point Wilson to Point No Point. In the more open waters of the sound southward of Point No Point the velocities are much less.

At Point Wilson and at Marrowstone Point, slack water occurs from ½, to 1 hour earlier near shore than in midchannel.

In the winter when southerly winds prevail, there is generally a northerly surface drift which increases the ebb current and decreases the flood current. This effect is about ½ knot between Nodule and Bush Points.

Possession Sound.—The tidal currents in the southern entrance of Possession Sound are weak and variable.

Hood Canal.—Between Foulweather Bluff and Misery Point, the tidal currents have an average velocity of about ¾ knot at strength, while in the southern part of Hood Canal, the average velocity at strength is only about ½ knot; at times of tropic tides, however, the greater ebbs attain velocities more than double these average values.

Agate Passage.—The tidal currents have velocities up to 6 knots at strength.

Directions for Admiralty Inlet and Puget Sound are given on page 48.

PORT TOWNSEND

(CHART 6405)

Port Townsend lies immediately southward of Point Wilson, described on page 272, and has its entrance between Point Hudson* and Marrowstone Point. It extends in a general south-southwesterly direction for 2.5 miles, with a least width of 1.5 miles, and then turns southeastward for 3 miles, with a reduced width, to its head. Inside Point Hudson, the depths range from 15 to 8 fathoms to Hadlock, at the head of the bay. It is an excellent harbor with good anchorage throughout and easily entered. The prevailing winds in summer are from west to southwest, and in winter generally in the southeastern quadrant. Southeasterly gales, sweeping up the long expanse of Hood Canal and across the low land at the head of the bay and at the ends of Kilisut Harbor into Port Townsend, are at times severe.

Point Hudson, on the western shore, about 1.7 miles southeastward of Point Wilson, is low and sandy. Its extremity is marked by **Point Hudson Light,** unwatched, shown from a white iron post on a white fog-signal house. The light is 24 feet above water, and visible 10 miles. The fog signal is sounded on a reed horn. Two government wharves are located 0.2 mile southward of Point Wilson. There is a depth of 20 feet at the northern and 25 feet at the southern wharf at MLLW. Northward of Point Hudson, shoals make out for nearly 0.2 mile, the outer limits being marked by a buoy.

Marrowstone Point, the eastern point at the entrance to Port Townsend, is low at its extremity but rises abruptly to a bluff about 120 feet high. The eastern extremity of the point is marked by a light. There are wharves on both sides of the point about 0.5 mile from the light. The northern wharf is abandoned and in bad repair. The southern wharf has 20 feet of water alongside at MLLW. Submarine telegraph cables are laid northwestward-and-southeastward from locations near the point.

Marrowstone Point Light* is shown from a small white square structure. The light is 28 feet above water, and visible 11 miles. The fog signal is sounded on a reed horn.

Midchannel Bank extends northwestward from Marrowstone Point about 2 miles toward Point Wilson, with depths varying from 5¾ to 10 fathoms.

Port Townsend, the principal town, is situated on the western shore immediately southward and westward of Point Hudson. It is a port of entry for Puget Sound. The depths at the wharves are ample.

Pilots for Puget Sound and Alaska may be had at Port Angeles, see page 268.

Towboats.—There are no towboats stationed at Port Townsend, but they may be obtained from Seattle or other Sound ports.

Quarantine services and medical attentions as are necessary, are performed under the direction of the Coast Guard. There is no regularly assigned quarantine or relief station at Port Townsend.

Customs.—The United States Customs Service maintains a station in the Federal Building, in charge of a collector of customs.

Anchorage.—The usual anchorage is about ½ to ¾ mile southward of the railroad ferry landing in 8 to 10 fathoms, muddy bottom. In southerly gales, better anchorage is afforded closer inshore off the northern end of Marrowstone Island or near the head of the bay, in moderate depths, muddy bottom.

Boat Harbor.—A haven for small boats, with a depth of 10 feet has been built

*Lat. 48°06′.2, Long. 122°41′.2: Charts 6405, 6300, 6450.

by the port of Port Townsend 1 mile southwestward of Point Hudson. There are lights at the entrance and a light on the southern corner.

Tides.—The mean range of tide at Port Townsend is 5.1 feet. The range between mean lower low water and higher high water is 8.3 feet. Because of the large diurnal inequality in this vicinity, at times of the moon's maximum declination, there may be only one high water and one low water a day. Reference should be made to the tide tables which give daily tide predictions for Port Townsend.

Supplies.—Provisions and ship chandlers' stores can be obtained. Water may be had at the wharves. A limited amount of coal is on hand, but any amount can be supplied at short notice. Fuel oil may be obtained in limited amounts; gasoline and Diesel oil may be obtained at several small oil wharves.

Repairs.—There are no drydocks, and minor repairs only can be made. There are facilities for hauling out launches and fishing boats, up to 85 feet in length, 8-foot draft, and 300 tons deadweight.

Communication with ports in Puget Sound and British Columbia is had by regular steamers, and passenger and automobile ferries, and there is also a railway car ferry service to Seattle. There are rail and bus connections with Port Angeles. Port Townsend is a point on the Olympic Loop Highway, which encircles the Olympic Peninsula and connects with Seattle through Olympia. There are telephone and telegraph facilities.

Storm warnings, day and night, are displayed by the Weather Bureau from a steel tower in front of the former marine hospital, now unused.

Glen Cove is situated about 2.2 miles southwestward of Point Hudson. A large paper mill is located here. There is a wharf for ocean vessels. An area surrounding the wharf and extending to deep water has been dredged to a depth of 30 feet at mean low water; the northern edge of the dredged area is buoyed. A lighted range for approaching the wharf has been established. The front light is located on the outer and northeastern corner of the pier. A fog-signal horn is located on the outer mill. This plant, with large white building and tall stacks, is the chief industry in the bay. The building and stacks are prominent.

Irondale, on the western shore about a mile from the head of the bay, is the site of an abandoned iron mill. The old mill and buildings are prominent, but only a few piles mark the site of the former wharf. Shoal water extends 0.2 mile from shore for nearly 0.5 mile northwestward of the mill. About 0.2 mile northwestward of the mill near the southern entrance point of **Chimacum Creek,** there is a long wharf owned by a fish company.

Hadlock, a village with a post office, at the head of the harbor, formerly exported considerable lumber. The sawmill has burned down. There is a landing wharf, but in 1941 there were submerged pilings off the wharf, and local knowledge was necessary to avoid them.

Oak Bay, described on page 317, is connected with the head of Port Townsend by **Port Townsend Canal** dredged 75 feet wide and 15 feet deep, with jetties at the south end which are almost submerged at high water. The canal is subject to considerable shoaling. The controlling depth in May 1940 was 15 feet. †In _____ 19___, the controlling depth in the channel was _____ feet. There is a light at each entrance on the western side of the canal. Both lights are shown from pile dolphins; the one at the southern entrance is at the end of the jetty. The currents through this

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

canal are strong at times and should be watched. There is no particular danger from them as the channel is wide and straight, but there are strong eddies at the south end on the ebb tide. A ferry crosses the northern end of the canal at frequent intervals. The ferry slips are not prominent, but are well out of the routes through the canal. There are two overhead wire crossings with sufficient clearance to accommodate the general traffic. Rules and regulations for the waterway connecting Port Townsend Bay and Oak Bay are prescribed by the Secretary of War.

Kilisut Harbor, separating **Indian Island** on the west and **Marrowstone Island** on the east, is a narrow inlet extending about 4 miles in a southeasterly direction, with an average width of 0.5 mile; the entrance is about 2.5 miles westward of Marrowstone Point. The entrance channel is winding, with a least depth of about 11 feet; inside good anchorage is afforded in 4 to 5 fathoms. At the southern end of the harbor the two islands are connecetd by an earth-filled causeway. This inlet is little used and local knowledge is necessary to enter.

ADMIRALTY INLET

(CHART 6450)

Admiralty Bay, eastward of Admiralty Head, described on page 272, is used only occasionally as an anchorage, as it is exposed to southwesters, and has hard bottom and strong currents.

Marrowstone Point is described on page 315.

Bush Point* is marked by a light 25 feet above the water, on a white pyramidal building, at the end of a low sand spit. A fog signal is sounded on an air horn. Back of the spit the land shows as a low timbered point from northward or southward. The flood current is reported to set strongly onto Bush Point.

Oak Bay is a cove on the western side of Admiralty Inlet, westward of the southern ends of Marrowstone and Indian Islands. A shoal extends southward of the eastern entrance point and is marked by a buoy. For Port Townsend Canal, see page 316.

Mutiny Bay, northwestward of Double Bluff, affords temporary anchorage near the center in 10 to 20 fathoms, which may be used if overtaken by fog. The shores are partly bluff and otherwise low. **Austin,** a village with a post office, is just northwestward of the middle of the bight. Strong tide rips, at times dangerous for small boats, occur off Double Bluff, particularly on the ebb with strong northwesterly winds. An eddy is reported in Mutiny Bay on the ebb.

Double Bluff consists of bare, white cliffs, 300 to 400 feet high on its eastern face, but much lower on its southwesterly face. Shoals extend nearly 600 yards westward from Double Bluff and are usually marked by kelp. A lighted trumpet buoy is moored off the edge of the shoal.

Foulweather Bluff, immediately westward of which lies the entrance to Hood Canal, see page 340, is one of the most prominent cliffs in Puget Sound. The northern face, which is bare, is 0.5 mile broad and consists of vertical, grayish sand and clay bluffs, 225 feet high, sloping off on the eastern side to a bluff 40 feet high, but on the Hood Canal side the point is steep and high. At the top of the bluff is a growth of fir and underbrush. The 20-fathom curve lies about 0.8 mile off the bluff; depths of less than 6 fathoms are charted nearly 0.5 mile northward of the head. There are several boulders which bare at low tide within 100 yards northward of the highest part of the

*Lat. 48°01′9, Long. 122°36′3: Chart 6450.

bluff, and sunken boulders are reported as reaching 200 yards eastward from the extremity and in line with the face of the bluff. If overtaken by fog, temporary anchorage may be had 0.5 mile northward of Foulweather Bluff, in not less than 10 fathoms.

At times there are tide rips northward of and around Foulweather Bluff sufficiently heavy to be dangerous to small craft and to break up log rafts. This is most pronounced when the ebb current from the main body of Puget Sound meets that of Hood Canal off the point, and particularly so with the ebb against a strong northerly or northwesterly wind.

If bound for Seattle see page 319.

PORT LUDLOW

(CHART 6406)

The entrance to **Port Ludlow,** on the western shore of Admiralty Inlet, lies 9 miles southward of Marrowstone Point and on the west side at the entrance to Hood Canal. From the entrance, which is broad, the bay extends in a general southerly direction 2.5 miles, terminating in a basin 0.5 mile in diameter. The basin affords good anchorage in 7 to 8 fathoms, soft bottom; the shores are fairly steep.

Tala Point, the eastern point at the entrance, is bluff and wooded, and about 310 feet high. **Colvos Rocks,** three in number, lie 1.2 miles northwestward of Tala Point and about 0.3 mile off the western shore; the westernmost rock is 25 feet high and of small extent, with deep water around it. There is a light shown from a small white structure on this rock. From the other two a bank with 7 to 29 feet extends to Tala Point. The passage between the rocks and Tala Point is described under channels.

Snake Rock lies 0.4 mile 231° from the western Colvos Rock and 300 yards offshore; it is 150 yards in extent and shows slightly above high water. The rock is marked by a light on an iron post, at an elevation of 15 feet above water.

Klas Rock lies 0.6 mile 356° from the western Colvos Rock and 0.2 mile from the western shore abreast the narrow entrance to **Mats Mats,** a small lagoon; it is of small extent and portions of it show a few feet at high water. The rock is marked by kelp and surrounded by deep water, with 16 fathoms between it and the shore.

Port Ludlow is situated on the northern side of the basin. Only the tall stack remains of a former sawmill; the piers of that mill are in ruins with only the piling and some decking remaining. Considerable quantities of logs are rafted out of the bay; there are log dumps and log booms at the head of the bay. Towboats can be obtained by telephone arrangement with Seattle. Gasoline may be obtained and water is piped out onto the ferry wharf. There are a hotel, and a post office; telephone facilities are available: There is an automobile ferry to Edmonds.

Channels.—The deepest channel in entering lies eastward of Klas Rock and between Snake Rock and the western Colvos Rock; the width between the 5-fathom curves is 500 yards, with depths of 11 to 16 fathoms in midchannel. This channel has been dragged to a depth of 40 feet, and except for a 22-foot rock lying 225 yards southeastward from **Basalt Point** and about 0.6 mile northward of Snake Rock, a 1-foot shoal extending 175 yards from the western shore 0.4 mile southward from Basalt Point, and a 28-foot spot 200 yards southeastward of Klas Rock, it is clear to within 125 yards of Colvos Rock Light and 50 yards of Snake Rock. The channel between Colvos Rocks and Tala Point is marked by two buoys; one of which is a lighted trumpet buoy. An unlighted range for entering is composed of the northeastern gable of the community house, a large rectangular gray house with three tiers of windows near the beach, for a

front mark and a high, 186 feet, water tank for a rear mark. The channel depth ranges from 21 to 27 feet, with 24 feet on the range and deeper water near the northern buoy.

Direction, Port Ludlow.—From northward, the course should be shaped to pass 0.2 mile eastward of Klas Rock; pass to the westward of Colvos Rock Light at a distance of 200 yards, and midway between it and Snake Rock Light. Then steer **182°**, giving the western shore a berth of about 0.2 mile; haul southward and westward into the port, favoring the point on which the mill is located when rounding into the basin, and anchor as desired.

If entering by the eastern channel, steer the range, **230°**, across the bank between Colvos Rocks and Tala Point until abeam of the latter, and then steer southwestward to the wharves or anchorage. Caution is necessary in entering this channel, as the buoys may be dragged from position by log tows. Large vessels should judge their position by the range rather than by the buoys.

PUGET SOUND TO SEATTLE

(CHART 6450)

Useless Bay, to the eastward of Double Bluff, is open to the southwestward. The shores are in part bluff and in part low, with a fringe of marsh nearly around the bay. Flats and shoal water extend well off the shore, with a maximum distance of 0.5 mile at the head of the bay. **Deer Lagoon,** large and shallow, extends inland from the head of the bay.

Hansville, about 2.5 miles eastward of Foulweather Bluff, is a small village with a post office. There is a landing wharf built out to 12 feet. It is connected with the highway system of Bainbridge Island. There are a large group of houses and an auto camp extending along the shore to the eastward. **Norwegian Point**, low and rounding, lies about 0.2 mile northwestward of Hansville. The bight between Foulweather Bluff and Norwegian Point is locally known as **Skunk Bay.**

Point No Point, on the western shore of the sound about 3.5 miles eastward of Foulweather Bluff, is a low sand spit and marked with a light and fog signal station. The **Point No Point Light*** is shown from a white square tower. The light is 23 feet above water, and visible 10 miles. The fog signal is sounded on a reed horn. Boulders extend about 200 yards from **Pilot Point** about 2.2 miles southward of Point No Point.

Scatchet Head and **Possession Point,** at the southern end of Whidbey Island, are both prominent, especially from southward, the white bluffs being visible for a considerable distance. Shoals extend 0.5 mile offshore immediately westward of Scatchet Head and over 0.2 mile offshore from the head to Possession Point; those off Possession Point are marked by a lighted bell buoy.

Possession Sound and tributaries are described on page 334.

Eglon is a small village with a post office about 3 miles southward of Point No Point. It has a landing wharf which is in poor condition. The water southward of the wharf is shoal, and vessels approach and back away from the wharf from the northward.

Apple Cove Point is a low sand spit projecting 220 yards from the high, wooded land about 6 miles southward of Point No Point. There are some houses located here. The point is steep-to, but a shoal makes out nearly 0.5 mile southeastward from it. Just off the point there is light on a pile dolphin. Heavy tide rips caused by strong northwesterly winds and a strong ebb tide are encountered in the vicinity of the light.

*Lat. 47°54.7, Long. 122°31.5: Chart 6450.

Appletree Cove is the open bight on the western side of the sound about 1.5 miles southward of Apple Cove Point. It affords anchorage in 5 to 10 fathoms inside the line of the entrance points, with some shelter from winds drawing in or out of the sound, but not from northward and southeastward

Kingston is a town with a post office, situated on the northern side of the cove. It has a combination landing wharf and ferry slip, built out to 6 feet. A small freight vessel stops here, and there are several daily trips of an automobile ferry from Edmonds.

Landmark.—There is an electric power plant with a prominent lighted sign about 3.2 miles southward from Apple Cove Point and just southward of **President Point.** From here a submarine cable crosses to Richmond Beach, on the eastern shore. Shoal water extends nearly 0.2 mile from high water line off the power plant.

Edwards Point is a high wooded point on the eastern side of Puget Sound about 8.5 miles east-southeastward of Point No Point. It is a turning point for the steamers running from Seattle northward into Possession Sound and adjoining waters. A large oil storage and distributing plant is located on Edwards Point. With its many large tanks on and below the bluff, the point is prominent from seaward. A wharf with a 256-foot berthing face, extends to deep water. Dock lights, a lighted sign, and an electric fog siren are maintained on the wharf by private interests. Petroleum products in any quantity may be obtained.

A radio telephone, operated continuously by the Pacific Telephone & Telegraph Co. for the use of vessels navigating Puget Sound, is located on the wharf at Edwards Point.

Edmonds is located about a mile northeastward of Edwards Point. It has two shingle mills and is the center of an agricultural community. It has telegraph and telephone connections, and hotels, and is served by railroad, ferries, and buses. There is a town wharf built out to 15 feet, with water piped to the end, and a ferry slip. It is the terminus of automobile ferries to Port Townsend, Port Ludlow and Kingston, which connect with the highway and ferry system of the Olympic Peninsula.

Point Wells is a low sandy point projecting 450 yards from the high land about 1.2 miles southward of Edwards Point. It is distinguished by prominent oil tanks. It is a water terminal and storage plant for two large oil companies. There is berthing space for several large vessels, and ample depths of water alongside both wharves. Northward and southward of these wharves shoals extend well offshore and care should be taken to avoid the shoal water when coming alongside or leaving the wharves at Point Wells.

A fog signal consisting of an electric siren is maintained on the Standard Oil Co. wharf. A lighted range for clearing the shoals northward of the wharves is maintained by private interests.

Richmond Beach is a town situated about 0.5 mile southward of Point Wells. Submarine cables have been laid from Richmond Beach across Puget Sound to President Point. Vessels should not anchor in this vicinity.

Port Madison (**chart 6443**) is on the western shore of Puget Sound, about 12 miles southward of Point No Point. It is included between the northern end of Bainbridge Island and **Point Jefferson,** and is about 2.5 miles long in a westerly direction, with an average width of 2 miles. The depths range from over 80 fathoms at the entrance to 20 fathoms less than 0.5 mile from the beach, but the port affords anchorage closer inshore in 15 to 16 fathoms, sticky bottom. In the southwestern part it connects with Port Orchard, described on page 345, through Agate Passage.

The northern shore is formed by broken white bluffs, and low beaches between,

and bordered by sand and shingle beaches which bare at low water, in some cases, for a distance of nearly 0.2 mile. The bluffs on the western shore are moderately low; the buildings of the Indian reservation near the entrance to Agate Passage are prominent. The town of **Suquamish** is situated on the western shore about 0.6 mile northward of Agate Point, the northern extremity of Bainbridge Island. There is a wharf built out to 14 feet; an automobile ferry from Ballard makes several daily stops. **Kitsap** and **Indianola** are two small villages on the northern shore of Port Madison. The post office is at Kitsap. There are a store, a highway filling station, and a landing wharf built out to 17 feet. Care must be taken in going to or from the wharf at Indianola because of the shallow water which lies just eastward of the outer end of the wharf. The southern shore of Port Madison is composed of broken bluffs, except where it is indented by the narrow arm extending southward about 1 mile, on which is situated the town of Port Madison.

Miller Bay, on the northwestern part of Port Madison, is used by shallow draft pleasure craft. The channel, marked by private buoys, should not be used at low tide on account of the very irregular bottom. Anchorage in depth of 6 to 7 feet, sticky mud bottom, may be had north of the second buoy. The controlling depth in this anchorage is about 1½ feet.

Point Monroe,* the southern point at the entrance to Port Madison is a low, narrow, sand spit, curving westward and southward and marked by a light. **Point Monroe Light,** on a white house on crib, is 20 feet above water, and visible 5 miles.

The entrance to the inlet leading to the town of **Port Madison** is about 0.8 mile westward of Point Monroe Light. The town is a popular summer resort and there are many cottages along the shores of the inlet. The channel in entering, with a least depth of 14 feet, is narrow, and local knowledge is necessary to keep in the best water. There is a wharf built out from the eastern shore, about 400 yards inside the entrance, with a depth of 12 feet alongside. There is an old ballast dump nearly bare at low water extending on both sides of the wharf approximately parallel to the beach, with its outer limit about 60 feet inside the face of the wharf. A small freight and passenger vessel from Seattle calls here. Care should be taken to avoid the cluster of sunken rocks about 100 yards off the eastern side of the entrance. The old mill wharf is in ruins. There are several landings for launches in the inlet. Sheltered anchorage for small craft may be had in depths up to 21 feet, mud bottom.

The approaches to Port Madison have been examined by the wire drag and found free from obstructions.

Meadow Point (**Chart 6449**), on the eastern shore, nearly opposite Point Monroe, is a low, grassy point, with a marshy lagoon within, and higher ground behind it. The city of Seattle maintains a bathing beach just southward of the point.

SKIFF POINT TO RESTORATION POINT

(CHART 6444)

Murden Cove is an open bight on the western side of the sound about 3 miles southward of Point Monroe. An extensive flat which bares at low tide, extends almost 0.5 mile from the head of the cove, and outside of it the depth increases rapidly to 15 fathoms. **Skiff Point,** the northern entrance point, has low, yellow bluffs to the southward. A shoal extends about 250 yards from Skiff Point; this shoal is reported to be

*Lat. 47°42′.6, Long. 122°30′.6: Charts 6443, 6450.

building out and should, therefore, be given a wide berth. **Yeomalt Point,** the southern entrance point, is a low, grassy, sand spit 150 yards wide, rising gradually to the general level of the high land. **Rollingbay** is a community of summer homes on the northern shore of Murden Cove. Moran Junior College, with prominent white buildings and a private landing wharf with 14 feet alongside, is located on the northern side of Skiff Point. There is a group of summer homes, with a landing wharf a short distance northwestward from the college wharf.

Ferncliffe and **Yeomalt** are communities of summer homes with wharves built out to 11-foot depths. They are 1 mile and 0.4 mile, respectively, northwestward of Yeomalt Point. There is a small wharf for a Y. W. C. A. camp with a depth of 12 feet alongside, 0.1 mile northwestward of Yeomalt Point.

Eagle Harbor is situated on the eastern shore of Bainbridge Island, 5 miles southward of Point Monroe and opposite Elliott Bay. It is about 1 mile long with a width of 0.5 mile and affords excellent anchorage in 30 to 36 feet, muddy bottom. It narrows at the head to 300 yards and winds westward for 0.8 mile over flats which bare at low tide.

A shipbuilding plant is located on the northern side of the harbor about 0.8 mile from the entrance. It has marine ways capable of handling vessels of 3,000 tons' displacement. The steel cradle is 325 feet long and can take a draft of 17 feet foward and 21 feet aft. There are ample wharf facilities.

Hawley, a small community of summer homes, situated 0.4 mile eastward of the shipyard, has a landing wharf built out to 14 feet.

Winslow is the largest town on Eagle Harbor. It is situated on the northern shore and has a landing wharf near the head with 8 feet alongside. Gasoline and fresh water may be obtained from the oil wharf, adjacent to the landing wharf, and with the same depth alongside. There are daily steamers to Seattle and other Puget Sound ports; telephone and telegraph communications are available.

Wing Point is a small community on the northern shore of Eagle Harbor, just inside of Wing Point. There is a landing wharf with depths of 15 feet alongside. The steamer from Seattle lands here daily.

Creosote, a town on the southern side of Eagle Harbor, at the entrance, has an extensive creosoting plant. The main wharf has depths of 14 to 33 feet along the southern face. Fresh water is available. A long landing wharf for local traffic, built out to 11 feet, extends eastward from the point, and just northward of it is a railway-car ferry slip. A light and a fog horn are maintained at the end of the wharf. Creosote has extensive shipping to foreign and domestic ports of prepared piles and paving blocks. **Eagledale,** a small hamlet on the southern shore, about 0.5 mile westward of Creosote, has a landing wharf built out to 10 feet. It has a post office and limited supplies are available. Some piles remaining from an old gravel loading wharf at the foot of the high bluff about 500 yards southward of the Creosote wharf, are still standing.

There is communication with Seattle by daily steamers, by automobile via the Seattle Ferry, and by telephone.

Wing Point, on the northern side of the entrance to Eagle Harbor is a narrow, bluff point, 30 feet high, covered with trees to the edge.

Wing Point Reef extends southeastward for 0.5 mile from Wing Point, and is generally marked by kelp. The extremity of the reef is marked by a buoy.

Tyee Shoal, 0.6 mile southeastward of Wing Point, with a least depth of 15 feet, is marked by a lighted bell buoy.

A spit, bare at low water, extends 300 yards northward from the southern point at the entrance, and is marked by a lighted buoy off its northeastern edge. The spit also extends nearly 500 yards northwestward from the point, with depths of 3 feet and less; a buoy is moored off the end of the spit.

The entrance is deep, but only 200 yards wide between Wing Point Reef and the sunken spit on the west side of the channel, and caution is necessary in entering. The channel is marked by range lights.

Blakely Rock, the highest of four rocks, is prominent in approaching; it lies 0.8 mile northward of Restoration Point, and at high water shows about 15 feet at its highest point. It is 300 yards in extent, with shoal water, well marked by kelp, extending over 250 yards northward. It is marked by a light, shown from a white house. **Blakely Rock Light** is 20 feet above water, and visible 6 miles.

To enter give Wing Point a berth of not less than 0.9 mile and round Tyee Shoal bell buoy about 0.2 mile. Steer the lighted range course **341°**. **Eagle Harbor Range, front,** is a white arm and two circular daymarks with red vertical stripes on black pile dolphin and **Eagle Harbor Range, rear,** is a white arm and a square daymark with red vertical stripe on post on bank westward of Wing Point. Pass about 75 yards eastward of the first buoy and steer **299°** to clear the northwestern end of the spit on the south side, and when past the buoy marking its northwestern extremity, haul southwestward into the harbor, following the northern side at a distance of 350 yards, and anchor as desired.

Blakely Harbor is a small inlet situtated on the eastern shore of Bainbridge Island near its southern end. It is about 1 mile in length and at the entrance nearly 0.5 mile wide, narrowing to the head. The depths range from 108 feet at the entrance to 21 feet near the head. The usual anchorage is near the entrance in 54 to 96 feet, sticky bottom, slightly favoring the southern shore. There are many old pilings and dolphins in the shoal waters near the shores.

Port Blakely, on the northern shore, near the head of Blakely Harbor, has a post office and a highway filling station; a few supplies may be obtained. There is a ferry slip on the north shore about 0.2 mile from the entrance and there is daily service to Seattle. The head of the bay is filled with log rafts. In former years Port Blakely was an important lumber port. The mills and wharves and most of the houses have been torn down.

Directions are not needed for entering Blakely Harbor. Blakely Rock may be passed on either side but, if passing northward, it should be given a berth of not less than 0.3 mile.

Restoration Point is flat and about 10 feet above high water for 300 yards, beyond which it rises abruptly to a wooded knoll about 100 feet high, on which a number of large buildings are prominent. A submarine cable extends from Restoration Point eastward to Alki Point.

Decatur Reef, partly bare at low water, extends 300 yards eastward of Restoration Point. The reef is marked by a lighted bell buoy off its outer end.

SEATTLE HARBOR AND LAKE WASHINGTON

(CHART 6449)

West Point, at the northern entrance to Elliott Bay is a low, sandy point which rises abruptly to an elevation of over 300 feet about 0.4 mile from its extremity, which

is marked by a light. The edge of the shoal extending southwestward from the point is marked by a buoy.

West Point Light* is shown from a white square tower. The light is 23 feet above water, and visible 10 miles. The fog signal is sounded on a reed horn.

Shilshole Bay lies between Meadow Point described on page 321, and West Point. The entrance to the Lake Washington Ship Canal lies about midway between the two entrance points; a lighted bell buoy is moored off the entrance to the canal. Southeastward of the canal entrance are clay cliffs for a distance of about 0.5 mile.

Alki Point, the western extremity at the southern entrance to Elliott Bay, is a low point with a small prominent wooded knoll, about 80 feet high, immediately behind it; eastward of the knoll low land extends for nearly 0.4 mile before rising to the high land extending southward from Duwamish Head.

Alki Point Light is shown from a white octagonal tower attached to a building situated on the extremity of the point. The light is 39 feet above water, and visible 12 miles. The fog signal is sounded on a reed horn.

Elliott Bay is on the eastern shore of the sound about 35 miles southward of Marrowstone Point; the entrance is between West Point and Alki Point about, 5 miles southward. The bay proper, included between Smith Cove and Duwamish Head, has a width of nearly 2 miles and extends east-southeastward for nearly the same distance. The bay is deep and free from dangers throughout.

Magnolia Bluff, largely bare, light colored, and rising in places to nearly 300 feet, extends along the northern shore from West Point to Smith Cove.

Fourmile Rock lies 60 yards off shore, 1.7 miles southeastward of West Point Light. **Fourmile Rock Light** is shown from a white square house. The light is 15 feet above water, and visible 9 miles. A fog signal is sounded on an air diaphragm horn.

Duwamish Head 300 feet high, about 1.8 miles northeastward of Alki Point, is bluff and steep on its northern face. A shoal extends about 60 yards northwestward from the head. **Duwamish Head Light** is shown from a white house on piles, about 450 yards northwestward of the point. The light is 32 feet above water, and visible 11 miles. The fog signal is a diaphragm horn.

Seattle, the largest and most important city on the sound covers the entire shore of the bay. It has spread northward to include **Ballard,** eastward to Lake Washington, southward around the head of Elliott Bay, and westward to embrace West Seattle and the east shore of the sound to and beyond Alki Point. Its commerce, both foreign and domestic, is extensive, and it is the terminus of or connects with several transcontinental railroads. It is the terminus of several lines of steamers operating across the Pacific or through the Panama Canal, and connects with points north and south by rail and water. Its railroad and shipping facilities give it a large proportion of the Alaska commerce. Coal, lumber, grain, fish, machinery, and general merchandise are largely exported. The wharves are extensive, with sufficient depth for any draft. Vessels usually go direct to the wharves. A mooring buoy is maintained by the city.

Approaching the city at night, the light (alternately flashing red, white, and blue) on the top of the Smith Building and the large neon sign "Port of Seattle" at the Bell Street Terminal afford good marks. Three radio towers are in the southeastern portion of the bay.

West Seattle, on the south shore of the bay, included in Seattle, has wharves, a

*Lat. 47°39′.7, Long. 122° 26′.1; Charts 6449, 6450.

flour mill, and grain elevators. Deep-draft vessels can lie at the wharves. It connects with Seattle by rail, trolley, and highway.

The **Duwamish River** empties into the head of Elliott Bay through the East and West Waterways. The dredged material was deposited between the two waterways to form **Harbor Island.** This area is occupied by industrial concerns.

The river is crossed by a number of drawbridges. See table of bridges on page 330.

East Waterway.—The entrance of East Waterway is marked by a light on the outer end of wharf on the western side of entrance to waterway. A fog signal is sounded on an electric bell. The waterway serves a number of modern terminals, including grain elevators, cold-storage plants, fuel-oil storage, and general cargo docks. Large vessels in foreign and intercoastal trades berth and load in this waterway.

West Waterway.—The entrance is marked by a light on a white house on wharf on the eastern side of entrance to waterway. A fog signal is sounded on an air diaphragm horn. There are several terminals and docks in West Waterway, but it is not developed to the extent of East Waterway. At the northwestern corner of Harbor Island is a large shipyard with three floating drydocks.

Depths Duwamish Waterways.—The project depths are as follows: West Waterway 34 feet for a distance of 6,500 feet; East Waterway 34 feet for a distance of 5,900 feet over a width of 750 feet; Duwamish Waterway 30 feet between West Waterway and First Avenue South, thence 20 feet to Eighth Avenue South, thence 15 feet to a point about 1.4 statute miles above Fourteenth Avenue South. The controlling depths were as follows: West Waterway, 34 feet except along the edges, in June 1939; East Waterway, 34 feet except along the edges, in June 1939. Duwamish Waterway, 27 feet from West Waterway to First Avenue South, 18 feet from First Avenue South to Eighth Avenue South except for a 10-foot depth near the Eighth Avenue Bridge, 13.7 feet from Eighth Avenue South to Fourteenth Avenue South, in June 1939. A survey completed in April 1941 showed a controlling depth of 15 feet for a distance of 3,200 feet upstream from Fourteenth Avenue South, 10 feet for the next 2,700 feet, then gradually decreasing to 2.9 feet in the turning basin at the head of the waterway. †In _____ 19____, the controlling depths in the channel were: _____

_____

_____

_____

_____

Lake Washington Ship Canal extends from Puget Sound through Shilshole Bay, Salmon Bay, Lake Union, Portage Bay, and Union Bay to deep water in Lake Washington (chart 6447). The controlling depths in 1940 were as follows: From Puget Sound to the Great Northern Railway bridge, 33 feet thence 30 feet to Lake Union, thence 30 feet to Lake Washington. †In _____ 19____, the controlling depths in the channel were: _____

_____

_____

A double lock and fixed dam with movable crest and necessary accessory works are located at the Narrows at the entrance to Salmon Bay, approximately 1.2 miles from the deep water in Puget Sound. The large lock has a clear width of chamber of 80 feet, a maximum available length of 760 feet, a lift of 26 feet, and a depth on lower

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

miter sill of 29 feet at MLLW. The small lock has a clear width of chamber of 30 feet, a maximum available length of 123 feet, a lift of 26 feet, and a depth on lower miter sill of 16 feet at MLLW. Ocean-going vessels make the passage through the large lock in less than 30 minutes, and small vessels pass through the small lock in 5 to 10 minutes.

The channels are marked by lighted ranges and buoys, and crossed by a number of drawbridges the details of which are given in the table on page 330.

Regulations for the government of the Lake Washington Ship Canal.—The following extracts from regulations prescribed by the Secretary of War are quoted as follows:

Signals.—All steamers desiring to use the locks shall signal for the same by *two long and two short blasts of the whistle,* except vessels having tows which shall signal by *two long and three short blasts of the whistle.* The duration of the long blast shall not exceed five seconds.

Speed.—All vessels shall proceed at reduced speed within the canal limits, as follows:

(*a*) From deep water at the westerly entrance of the canal to the Great Northern Railway bridge, the rate of speed shall not exceed 6 miles per hour.

(*b*) Between the Great Northern Railway bridge and the east end of the guide pier above the locks, the rate of speed shall not exceed 4 miles per hour.

(*c*) Between the Northern Pacific Railway bridge and a point 400 feet east of the Fremont Avenue bridge, and between the west end of the Portage Cut and Foster Island, the rate of speed shall not exceed 6 miles per hour.

(*d*) In all other portions of the canal the rate of speed shall not exceed 10 miles per hour.

Stopping before entering the locks.—All vessels or boats approaching the locks shall stop at the points indicated by signs placed on the canal piers until ordered to proceed into the lock.

(*a*) Masters of vessels shall exercise the greatest care when entering either lock. The speed of the vessel shall be so slow that in case the engine mechanism fails to operate properly, the momentum of the vessel can easily by stopped by her lines. Vessels entering the small lock shall come to practically a full stop at the guard gate and then proceed into the lock at very slow speed.

Precedence at the locks and in the canal.—In passing through the canal and locks, craft belonging to the United States Government or the city of Seattle may be given precedence over all others. Unless otherwise directed by the district engineer or his authorized assistants, all registered merchant vessels shall pass through in the order of their arrival at the canal, with the exception that passenger vessels running on schedule time shall have precedence over freight vessels and both shall have precedence over towing floated timbers or logs. Unregistered craft will be given separate lockage only on special permit from the district engineer or his authorized assistants.

(*a*) In passing through the canal where the channels are less than 200 feet in width, log rafts shall be pulled out of the channel if practicable when meeting other vessels or when other traffic going in the same direction wishes to pass. Whenever practicable tugs, launches, and small craft shall keep close to the side of the channel when large vessels are passing.

Mooring in locks.—All vessles, rafts, and floating craft of every description when in the lock, shall be securely fastened to the snubbing posts or mooring hooks on the lock walls, and the lines shall not be released until the signal has been given to leave the lock. Vessels shall not delay in the lock after the signal has been given to leave.

Aids to navigation.—The axis of the channel between Puget Sound and the Great Northern Railway bridge below the locks is marked by a lighted bell buoy on the entrance range 1⅛ miles from the front light and a range placed near the Great Northern Railway, two red lights at night and two boards painted white with a vertical red stripe for the day range. A group occulting green light with an air diaphragm horn for fog signal is established about 1,200 feet east of the Puget Sound entrance and 200 feet north of the channel line. The sides of the channel are marked by red and black buoys, and an occulting white light is established at the extreme point of the high land south of the channel. Between the locks and Lake Washington the channel is marked by buoys where necessary, and a flashing white light is established on the axis of the channel near the entrance at Lake Washington.

Signal lights.—Red and green signal lights are established on the guide pier below the Great Northern Railway bridge below the locks and on the guide pier above the large lock. Green indicates that waiting vessels must proceed immediately into the lock, and that the lock is empty of all traffic, and vessels leaving the lock have either passed through the Great Northern Railway bridge below the lock or have entirely cleared the lock at the upper end. If the red light is burning, vessels for the large lock must moor at the pier.

Red and green signal lights have also been established above and below the small lock. The green light indicates that the lock has been cleared of all traffic and vessels may proceed into the lock. The red light indicates that the lock is not ready and vessels must wait at the moorings provided above and below the lock.

Vessels bound for the large lock, going east and vessels leaving the small lock, going west, when meeting in the vicinity of the Great Northern Railway bridge must pass to the left. If in doubt sound the whistle or horn to avoid accidents.

(*a*) The masters of vessels of every description approaching the locks from Puget Sound shall obtain instructions from the employees stationed on the west pier before passing the "stop" sign below the Great Northern Railway bridge.

(*b*) Two red lights, one vertically above the other, and two green lights, one vertically above the other, are installed on the west side of the Ballard Bridge, east side of the Fremont Avenue Bridge, 1,000 feet west of the Montlake Bridge, and 1,000 feet east of the Montlake Bridge, for the guidance of ships approaching the sections of the canal between Salmon Bay and Lake Union and between Lake Union and Lake Washington. Ships of 300 gross tons and over, and all vessels, with tows, except as herinafter provided, shall not pass the red lights. The green lights will indicate that vessels may proceed. Ships of less than 300 tons gross without tows may disregard these signals, but shall travel at very slow speed when passing other ships. Ships of 300 gross tons and over and vessels with tows, except logs, whose destination is between the Ballard Bridge and the Northern Pacific Railway bridge, may pass the red signals on the Ballard Bridge, provided such passage will not interfere with approaching traffic from Lake Union.

Oil or refuse.—No person shall throw, discharge, or deposit, either from any ship, barge, or other floating craft, or from shore, wharf, manufacturing establishment, or mill, any oil or refuse matter of any kind or description whatever into the canal; nor shall water discharged from the side of a ship be allowed to spill on the lock wall.

Fenders.—The sides and corners of all craft and rafts passing through the locks shall be free from spikes or projections of any kind that might injure the locks or other structures; ships must be provided with suitable fenders.

Keeping to center.—Vessels shall keep as near as practicable to the center of the canal, except when passing other craft.

Grounding.—In case of grounding, the rapid or strong working of the boats' engines is strictly forbidden.

Turning.—Vessels exceeding 100 feet in length are forbidden to turn around, or attempt to turn around, in the portion of the canal between the Northern Pacific Railway bridge and a point 400 feet east of the Fremount Avenue Bridge, or the portion between the west end of the Portage Cut and Foster Island.

Obstructing.—Vessels are forbidden to obstruct the canal in any way or to delay by slow passage through the canal the progress of other vessels.

Towing.—All boats engaged in towing vessels shall use tow lines of the least practicable length and shall have full control of their tows at all times. Towing more than one craft abreast is forbidden if the total width of the tow, including the towboat exceeds 70 feet.

Lake Union.—There are several shipyards and other industries located on Lake Union, but the volume of water-borne commerce on it is light.

Lake Washington.—This is a large body of fresh water lying just eastward of Seattle. There are numerous resorts and small towns around the shores of the lake, but except for logs and some lumber, there is but little water-borne commerce on the lake. There is a naval aviation field at Sand Point, and nearby is a speed-trial course, the ends of which are marked by ranges. The course is 1 nautical mile in length, and the bearings are 36¼° or 216¼° true. The University of Washington is situated northward of the channel connecting Lake Union and Lake Washington. Lake Washington has been examined by the wire drag and is clear of snags except as noted on chart 6449.

There is a wharf on the eastern side of the lake, northeastward of the south end of **Mercer Island,** that is 457 feet along its face and has a depth of 26 feet along this

face. This port is sometimes referred to as **"Port Quendall,"** which is derived from the railway switch station by this name, which is located at this point.

Harbor Regulations are enforced by a port warden with an office at Pier 1. The port warden maintains a radio station for the purpose of furnishing information concerning the harbor regulations, securing wharfage for incoming vessels, etc. Masters are invited to take advantage of this service. The charges are 5 cents a word for ship's business and 10 cents a word for private messages.

A copy of the "*Rules and Regulations*" for Seattle may be obtained from the Port Warden. The following are extracts from the harbor regulations:

No compulsory pilotage or harbor dues shall be charged any vessel navigating any of the above-described waters, either for arriving at or departing from the Seattle Harbor.

The resident owners, or agents, or the master of every vessel entering the harbor between the hours of eight (8) o'clock a. m. and five (5) o'clock p. m. of any day, except Sundays and holidays, shall report to the port warden before five (5) o'clock p. m. of such day, and if entering the harbor between five (5) o'clock p. m. of any day and eight (8) o'clock a. m. of the next day shall report to the port warden before five (5) p. m. of the next day, and if entering the harbor day or night upon any Sunday or legal holiday shall report to the port warden the next legal day, stating name of vessel, master, tonnage, amount and nature of cargo; and it shall be unlawful to fail, neglect, or refuse so to do: *Provided,* That these provisions shall not apply to vessels plying between Puget Sound ports.

All waters herein specified, subject to reservations for anchorage, shall be known as "fairway", and shall not be obstructed in any manner whereby navigation may be endangered or impeded, and shall include, subject to such reservations, the following described waters:

All of Elliott Bay lying easterly of a straight line drawn from Alki Point to West Point.

All of the East and West Waterways.

All of the Duwamish River.

All of the Duwamish Waterway project.

All of Salmon Bay.

All of Lake Washington Canal, outside that portion which shall be under the supervision and control of the United States Government.

All of Lake Washington and Lake Union, lying or being within the corporate limits of the city of Seattle or within the jurisdiction and control of the city.

All that portion of Shilshole Bay, lying easterly and southerly of a line from West Point to the intersection of the northern boundary of the city of Seattle with the outer harbor line.

All navigable waters in the projection of public streets, lying on the landward side of the outer harbor line shall be fairway. It shall be unlawful for the master or other person in charge of any vessel to anchor, tie, or make fast such vessel in any such fairway for a longer period of time than reasonably sufficient to load or unload the same, except that the port warden may, in his discretion, grant any permit for the use of any such fairway for a longer period of time whenever, in his judgment, such use will not interfere with the use of the fairway by any other vessel.

It shall be unlawful for any master or person having charge of any vessel to anchor or make the same fast in the waters of the fairway or anchorage, without first obtaining a permit therefor from the port warden.

Anchorage at city buoys.—Every foreign vessel and every American vessel engaged in foreign trade, of 500 tons register or over, attached to any city buoy, shall pay as follows: For the first 15 days or any part thereof, $1 per day: for each additional 15 days or part thereof, $10: *Provided,* That a minimum charge of $10 be made for making fast to any city buoy.

The port warden shall have power, and it shall be his duty, to remove any vessel whenever the same is anchored, moored, or landed at any anchorage, buoy, or wharf in violation of this ordinance, or whenever such removal becomes necessary to facilitate navigation or to provide access to such buoy, wharf, or anchorage for another vessel entitled to such access, and the cost of such removal, together with the damage by reason of any accident arising therefrom, or in connection therewith, shall be recoverable by the city of Seattle against such vessel so removed, or the master thereof.

Every vessel while backing out of any slip shall have at least one member of the crew on the lookout astern on the upper deck, such person to be in full view of the pilot house to warn the master, or the person in charge of such vessel, of the proximity of any obstruction to navigation of or the approach of another vessel. Every vessel shall continue to back a sufficient distance beyond the face of any pier to avoid any danger of accident or collision with any other vessel backing out from the same or any other slip. Every vessel backing out from a slip shall proceed slowly, using extreme care for the prevention of accident.

No lines or cables shall be stretched or maintained across slips without first obtaining a written permit from the port warden so to do.

It shall be unlawful for the owner or master of any vessel to allow the same to remain anchored or moored or made fast to or lie at any pier unless there shall be on board such vessel at all times a competent watchman.

Every gangway or other device by means of which passengers pass to or from any vessel shall be provided with a substantial handrail on each side thereof, both sides of which gangway, from the top of the handrail to the floor thereof, shall be enclosed in canvas or some other suitable material, and shall be so constructed as to bend as little as possible when in use by passengers. The top of the handrail shall not be less than thirty-six (36) inches above the floor of the gangway, and such gangways shall have attached thereto suitable ropes for making the same fast.

The port warden shall have power to forbid the use of any gangway whenever the use of the same shall be dangerous to the public, and it shall be unlawful for any person to again use such gangway until the same shall have been so repaired or reconstructed as to render the same safe for public use, and until the same, as reconstructed or repaired, has been inspected by the port warden and its use again approved by him.

No vessel containing a cargo or part cargo of explosives shall enter the harbor without a permit from the port warden therefor, and without first complying with all the provisions of this ordinance relating thereto.

No vessel shall be permitted to enter the fairways of the harbor with a quantity of explosives exceeding 20,000 pounds, and then only when such cargo is intended for local consumption within the city or for immediate shipment or transfer to interior points in less than carload lots.

Any vessel entering the harbor carrying a cargo or part cargo of explosives destined for points other than the city of Seattle, as herein specified, or while engaged in the transfer of explosives from one vessel to another, shall remain outside the fairways of the harbor and at least 3,000 feet from any shore line.

Only explosives permitted by the Interstate Commerce Commission regulations for interstate commerce shall be permitted within the harbor.

No vessel having any explosive on board shall remain at any pier between the hours of sunset and sunrise, except by written permission of port warden.

Every vessel at anchor in the harbor which has a cargo or part cargo of explosives shall, between sunset and sunrise, display at some point not exceeding twenty (20) feet above the hull of such vessel one red light in a lantern so constructed as to show a clear, uniform, and unbroken light visible all around the horizon at a distance of at least 1 mile, and every such vessel lying at any pier or at anchor between sunrise and sunset shall display from a conspicuous hoist and visible all around the horizon a red flag, being the International Code Flag "B".

All city floats now or hereafter established may be used by launches and other power boats for dockage purposes, other than the handling of freight, free of charge for a lying time not to exceed five (5) consecutive hours at any one time. After such time the port warden shall collect the sum of twenty-five (25) cents for every day, or fraction thereof, as a dockage charge. Whenever any person in charge of any boat shall use any city float for such a length of time as shall be to the detriment of other persons desiring to use such floats, the port warden is empowered to charge a weekly dockage fee of not less than five (5) dollars for every week or fraction thereof.

No article of any character shall be sold or offered for sale at any city float, or on any float located in any street end, without having first received written permission so to do from the port warden.

Bridges.—The Lake Washington Canal and the Duwamish River are crossed by a number of bridges, of which the following table gives the location, clear width of opening, and the whistle signal prescribed for use by the vessel desiring their opening:

Name of bridge	Type	Width of opening	Clearance closed [1]	Whistle signals
Lake Washington Ship Canal (Approaching from Seaward)		*Feet*	*Feet*	
Great Northern Ry. at 36th Ave., N. W	Bascule	150	41	— .
Canal Locks				— — . .
Ballard, at 15th Ave., N. W	Bascule	150	29	— .
Northern Pacific Ry	do	150	15	— . . .
Fremont Ave	do	150	29	— .
Aurora Ave	Fixed	525	135	
University Bridge, 10th Ave., N	Bascule	175	29	— . . .
Montlake Boulevard	do	150	30	— .
Lake Washington				
Mercer Island Bridge	Fixed	200	38	
Lake Washington Pontoon Bridge	Retracting	200		— .
Lake Washington Pontoon Bridge, West	Fixed	190	29	
Lake Washington Pontoon Bridge, East	do	190	30	
Duwamish Waterway				
West Spokane Street Highway	Bascule	150	40	— . . .
West Spokane St. Highway	do	150	40	— . . .
Northern Pacific Ry	do	150	4. 6	— . . .
First Ave., S	Swing	112	20	— — —
Fourteenth Ave., S	Bascule	125	32	— . —

[1] Clearance above H. W.

The following general **bridge regulations** apply to all bridges listed above:

1. The corporation or persons owning or controlling a drawbridge shall provide same with the necessary tenders and the proper mechanical devices for the safe, prompt, and efficient opening of the draw for the passage of vessels.

2. If the weather conditions are good and sound signals can be heard when a vessel approaches a drawbridge and desires to pass through the draw:

(*a*) The person in charge of such vessel desiring to pass shall cause to be sounded, within reasonable hearing distance of the bridge, repeating if necessary, and in time to give due notice to its operator, the opening signal prescribed under special regulations for the particular bridge.

(*b*) When the draw of the bridge can be opened immediately the draw tender shall reply by the signal prescribed under special regulations.

As used in these general regulations and in the special regulations prescribed, the term long blast of a whistle or horn shall mean a blast of four seconds duration, and a short blast shall mean one second duration.

(*c*) When the draw of the bridge cannot be opened immediately, the draw tender shall reply by the signal prescribed under special regulations.

(*d*) When, after a delay, as in 2 (*c*) the draw of the bridge can be opened and the vessel still desires to pass, the draw tender shall give the signal prescribed under special regulations.

3. When weather conditions prevent hearing sound signals:

(*a*) The person in charge of a vessel desiring to pass shall swing a white lighted lantern or white flag, the former by night, the latter by day; the person signaling to face the drawbridge and swing the lantern or flag in front of him at arm's length, in vertical circles.

(*b*) When the draw of the bridge can be opened immediately, the draw tender shall reply by raising and lowering a white lighted lantern or a white flag, the former by night, the latter by day; the movement to be vertical.

(*c*) When the draw of the bridge cannot be opened immediately, the draw tender shall reply by swinging a red lantern or red flag, the former by night, the latter by day; the person signaling to face the vessel and swing the lantern or flag in front of him at arm's length, in vertical circles.

(This signal may also be used by a vessel to countermand its signal to open draw.)

(*d*) When, after a delay, as in 3 (*c*) the draw of the bridge can be opened and the vessel still desires to pass, the draw tender shall give the signal prescribed in 3 (*b*) above, viz: Raising and lowering a lighted lantern or a flag.

4. When fog prevails by day or by night the draw tender on giving signal (2 (*b*), 2 (*d*), 3 (*b*), 3 (*d*) above) that draw will be opened, shall toll a bell continuously, during the approach and passage of the vessel.

5. The draw shall be opened with the least possible delay, upon receiving the prescribed signal: *Provided,* That the draw span shall not be opened when a train is approaching so closely that it cannot safely be stopped before reaching the bridge, or when a passenger or mail train is approaching within sight or hearing of the operator of the draw span.

6. Trains, wagons, and other vehicles shall not be stopped on a drawbridge for the purpose of delaying its opening, nor shall water craft or vessels be so manipulated as to hinder or delay the operation of a draw span, but all passage over, through or under a drawbridge shall be prompt, to prevent delay to either land or water traffic.

7. The foregoing general regulations (pars. 1 to 6) shall apply in the cases of all bridges, but to provide for distinctive signals given by vessels to particular bridges, as where two or more are within sight or hearing and but one bridge is desired to be opened, and to provide for closed or open periods when land or water traffic predominates, special regulations and exceptions are prescribed.

The following **special regulations** have been prescribed for the operation of the Lake Washington Ship Canal bridges:

Provided, That the Ballard Bridge, Fremont Avenue Bridge, University Bridge, and Montlake Bridge will not be required to open, on any day of the week except Sunday, between the hours of 7 a. m. and 8:30 a. m. and 4:30 p. m. and 6:15 p. m. for vessels or other water craft of less than 300 gross tons, unless such vessel has in tow a vessel of 300 gross tons, or over; and,

Provided further, That the draw in any of the above four city bridges need not be opened at any time for the passage of any vessel of less than 300 gross tons equipped with a movable stack or mast which can readily be lowered so as to permit its passage under the closed draw, unless it has in tow a vessel which is unable to pass under the closed draw. Any vessel of less than 300 gross tons regularly navigating the canal shall be subject to inspection and measurement by the district engineer, United States Engineer Department at Large, in charge of the locality, and said district engineer is hereby empowered to decide in each case whether or not the vessel shall be equipped with hinged or movable stacks, masts, and flagpoles which can be lowered to enable the vessel to pass under the closed draw of any or all the bridges. If the district engineer decides that such action should be taken, he shall notify the vessel owner and the bridge owner of his decision, specifying a reasonable time for making the alterations; and after the expiration of the time specified the draw need not be opened for the passage of such vessel unless it has in tow a vessel unable to pass under the closed draw.

The following **special regulations** have been prescribed for the operation of the Duwamish Waterway bridges:

For the Northern Pacific Railway bridge only, one long blast of whistle, followed quickly by one short blast.

For both the Northern Pacific Railway and West Spokane Street bridges, one loud blast of whistle, followed quickly by three short blasts.

Between the hours of 6:45 a. m. and 8:45 a. m., and 4:30 p. m. and 6:30 p. m. the draws of the West Spokane Street bridges need not be opened for the passage of vessels of less than 250 gross tons, unless such vessel has in tow a vessel of 250 gross tons or over.

Between the hours of 7 a. m. and 7:30 a. m. and 4 p. m. and 4:30 p. m., the draw of the city bridge at First Avenue South need not be opened for the passage of any vessel of less than 40 gross tons, unless said vessel has in tow, barge, or other floating object that will exceed the height of clearance at that time.

Between the hours of 7 a. m. and 7:30 a. m. and 4 p. m. and 4:30 p. m. the draw of the city bridge at Eighth Avenue South need not be opened for the passage of any vessel of less than 40 gross tons unless said vessel has in tow, barge, or other floating object that will exceed the height of clearance at that time.

The above bridges shall also be opened for the passage of vessels or water craft of any description propelled by other than steam power, upon like signals given by whistle or trumpet, or upon verbal request of the person or persons in charge of same.

(*a*) If the draw of any of the above bridges is ready to be opened immediately when the prescribed signal is given from the vessel, the signal shall be answered immediately by the same prescribed signal from a whistle or horn on the bridge; but if the draw is not ready to be opened immediately upon the prescribed signal being given on the vessel, the signal shall be answered immediately from the bridge by four or more short blasts of a whistle, horn, or megaphone, or four or more distinct strokes of a bell.

A **pontoon bridge** extends across the lake between the north end of Mercer Island and Seattle, with a draw span near the Mercer Island side. Fixed overhead spans are located near each shore. A fixed span extends eastward from Mercer Island to the mainland. The clearances are included in the above table. The following are extracts from **Special Regulations** prescribed for the operations of the Lake Washington pontoon bridge:

All vessels, craft, or rafts, not self-propelled, navigating Lake Washington, for which the opening of the bridge may be necessary, shall, while passing the bridge, be towed by a suitable self-propelled boat.

Upon the signal prescribed above being given, the draw shall be opened promptly for the passage of any vessel, or vessels, or other water craft not able to pass through the openings under the fixed spans of the pontoon bridge near each shore, or under the spans of the fixed bridge on the east side of Mercer Island.

Provided, That the bridge will not be required to open on any day of the week between the hours of 7:00 a. m. and 9:00 a. m. and 4:45 p. m. and 6:30 p. m. for any vessel or other water craft of less than 2,000 gross tons, unless such vessel has in tow a vessel of 2,000 gross tons or over, or a pile-driver that is unable to pass under the fixed spans; and

Provided further, That the bridge will not be required to be opened at any time for any craft towing logs or scows, after the owners of the bridge shall have provided fenders, approved by the War Department, at the openings under the approach spans of the pontoon bridge, adjacent to Mercer Island, and under the main span of the fixed bridge between Mercer Island and the mainland east of Lake Washington, unless such craft cannot pass under those spans; and

Provided further, That when the draw shall have been opened for ten minutes, or for such shorter period as may have been necessary for the passage of vesels, or other water craft, desiring to pass, it shall be closed for the crossing of vehicles or individuals, if any be waiting to cross, and after being so closed for ten minutes, or for such shorter time as may be necessary for the said vehicles or individuals to cross, it shall again be opened promptly for the passage of vessels or other water craft, if there be any such desiring and authorized herein, to pass at such time; and

Provided further, That, at night, between the hours of 9:00 p. m. and 5:00 a. m., the draw shall be opened for the passage of all vessels that cannot pass under the fixed spans upon notice given by telephone or otherwise to the bridge operator at least 30 minutes in advance of the time that the vessel desires to pass through the draw.

Pilotage is compulsory. Licensed pilots can be obtained for the sound or for the inside water to Alaska. See "Pilotage" on page 268.

Towboats.—Towboats are available in Seattle, ranging in horsepower from 15 to 1,000.

Quarantine.—Vessels subject to quarantine are boarded at Port Angeles. Fumigation with cyanide can be arranged for in Seattle. The quarantine office is located in the Federal Office Building, at First Avenue and Madison Street.

Marine hospital.—A marine hospital of the United States Public Health Service is situated at Fourteenth and Judkins Street, Seattle, on Beacon Hill, which overlooks

Elliott Bay. The outpatient office is located in the Federal Office Building, at First Avenue and Madison Street.

Customs.—Seattle is the headquarters of the Washington collection district. The customhouse is in the Federal Office Building, at First Avenue and Madison Street.

Immigration.—The United States Immigration Service maintains an office at 815 Airport Way.

Anchorage may be had within defined limits. In the Elliott Bay areas the water is deep, swinging room is limited, and vessels seldom anchor, usually going directly to the wharves. During heavy northerly weather, which is rare but occasionally occurs during the winter month, the anchorage is uncomfortable.

Currents.—As a rule, the tidal currents in the harbor have little velocity. At times, however, with a falling tide, an appreciable current will be found setting northwestward along the water front.

Tides.—The mean range of tide at Seattle is 7.6 feet. The range between mean lower low water and mean higher high water is 11.3 feet. A range of about 18½ feet may occur at the time of maximum tides. Daily tide predictions for Seattle are given in the tide tables published annually in advance by the United States Coast and Geodetic Survey.

Dockage and **wharfage** charges are made. They vary with the size of vessel and the class of cargo.

Wharves.—There is an extensive system of wharves, both municipal and private, some of which are equipped with the most modern facilities for handling cargo. The port of Seattle has constructed and operates a number of wharves specially equipped for handling the various commodities—grain, lumber, fish, fruit, etc.—which form the principal items in the commerce of the port.

Smith Cove Terminal, on the north shore about 3 miles eastward of West Point, consists of 4 piers, including the 2 terminals of the port commission, piers 40 and 41, which are among the largest in the country. They are well equipped with transit sheds, railroad connections, and cargo-handling gear, the largest crane being of 100 tons capacity. Much of the overseas passenger and freight traffic is handled over them. The berthing faces have 35 feet alongside. Eastward of these piers are the two piers of the Great Northern Railway, with depths alongside ranging from 18 to 43 feet.

Supplies of all kinds and in any quantity can be obtained.

There are **chart agencies** of the U. S. Coast and Geodetic Survey situated here.

Repairs of all kinds to hull and machinery can be made; there are numerous shipbuilding and repair plants with drydocks or marine railways of various sizes. The largest dock available (exclusive of the drydocks at the Bremerton Navy Yard, which are available for private use when not required by the Government) is 518 feet long, 89 feet wide (inside), and has a depth of 26 feet over the keel blocks. It is of the floating sectional type and has a lifting capacity of 15,000 tons.

Communication.—Seattle is served by three lines of transcontinental railways and is the terminus of several lines of freight and passenger steamers to the Orient. It is a port of call of many lines of intercoastal vessels, and has good coastwise service with points in California, Oregon, and Alaska. The Harbor Radio handles ship's business at 5 cents a word, and private business at 10 cents a word. This reduction in ship's business rates is intended to facilitate shipping. There are complete telephone, telegraph, and radio facilities, including two-way radiotelephone communications between ships in and near Seattle harbor and points on the interconnected Bell system land-line telephone network.

Airlines.—Seattle is served by 9 commercial airlines. There are 3 airports located at Seattle and 2 terminals on the waterfront for seaplane service.

A **Coast and Geodetic Survey District Office** is located in the Federal Office Building, First Avenue and Madison Street. Files of charts, coast pilots, and other publications are maintained for the use of mariners, who are invited to avail themselves of the facilities afforded.

Charts, coast pilots, current tables, and tide tables are kept for sale. Mariners observing any changes affecting charts or coast pilots are requested to notify the supervisor in charge of the district office.

A **Branch Hydrographic Office** is maintained in the Federal Office Building, Seattle. Bulletins are posted here giving information of value to mariners, who are also enabled to avail themselves of publications pertaining to navigation and to correct their charts from standards. No charge is made for this service.

The **Coast Guard District Office** is located in the Federal Office Building, Seattle.

Other Federal Activities are given in tables in the appendix.

Port Series No. 7 covers the port of Seattle.

Storm warnings are displayed by the Weather Bureau from the roof of the Exchange Building, First Avenue and Marion Street, and are plainly visible from the harbor.

POSSESSION SOUND

(CHART 6450)

Possession Sound enters at the southern point of Whidbey Island and extends in a general northerly direction for about 10 miles to its junction with Saratoga Passage and Port Susan. From the entrance it extends for 3.5 miles with an average width of 2 miles, and then expands to an irregular basin about 6 miles in diameter. The eastern part of this basin is filled with extensive flats, a large portion of which are bare at low water, and rise abruptly from deep water. These flats are intersected by several shifting channels, forming the mouth of the Snohomish River. These channels are under improvement by the Government and are used by light-draft river steamers that navigate the deeper waters of the river. The waters of the sound are generally deep, and the only anchorage used by large vessels is off the town of Everett, close inshore, in about 10 to 15 fathoms.

Meadowdale is a village with a post office situated on the eastern side of the sound about 4 miles southward of Possession Point, described on page 319. Two piers are located here about 0.5 mile apart. The northern pier is built out to 6 feet and has a face 160 feet wide by 200 feet long, with an approach 30 feet wide by 250 feet long.

Glendale, a village with a post office and a landing wharf in dilapidated condition, is situated on the west side of the sound, about 2.2 miles northward of Possession Point.

EVERETT HARBOR AND APPROACHES

(CHART 6448)

Elliot Point, on the eastern side of Possession Sound, about 4 miles northeastward of Possession Point, is a low spit projecting over 200 yards from the high land. It is prominently marked by **Mukilteo Light,*** shown from a white square tower. The light is 33 feet above water, and visible 11 miles. A fog signal is sounded on a reed horn.

*Lat. 47°56′.9, Long. 122°18′.3: Charts 6448, 6450.

Mukilteo is a small town eastward of Elliot Point. An automobile ferry runs between Mukilteo and Columbia Beach, on Whidbey Island. A wharf belonging to the Great Northern Railroad, for unloading oil from tankers, is located 2.2 miles eastward of Elliot Point. The tanks back of the wharf are prominent.

Everett is located on **Port Gardner** at the eastern end of Possession Sound, 4 miles northeastward of Elliot Point. It is the third largest city on Puget Sound. Lumber, wood products, pulp, and paper are the principal items of export, while logs, piling, and poles are imported. There are 9 deep-water wharves on Port Gardner with depths ranging from 12 to 38 feet. Three of these are used for public transportation purposes, 2 belong to fish-packing companies, and 2 to lumber mills, while 2 are operated by oil companies.

Pilots.—Pilots are not stationed at Everett, but may be obtained from the Puget Sound Pilots Association, Seattle, by telephone or radio.

Towboats.—Towboats, ranging in indicated horsepower from 40 to 400, are available.

Quarantine.—Vessels bound for Everett which are subject to quarantine inspection should receive this inspection at Port Angeles, and should not proceed from quarantine until inspected and granted free or provisional practique. Fumigation may be arranged through the Seattle office.

Customs.—Everett is a subport in the Washington customs district, the headquarters for which are located in Seattle. The customhouse is located in the Federal Building at the corner of Colby and Wall Streets.

Marine hospital.—The Public Health Service maintains a medical relief station and a contract hospital at Everett. The marine hospital is at Seattle.

Anchorages.—There are no designated anchorages in Everett Harbor, but vessels usually anchor about 0.5 mile southward of the jetty light in from 10 to 5 fathoms, sticky bottom.

Boat harbor.—The Everett Port Commission maintains floats for berthing small boats up to a length of about 50 feet. A pile breakwater affords shelter. Dockage is charged.

Harbor regulations.—Dumping fuel oil, refuse, and ballast, and pumping bilges is prohibited. The handling of explosives is prohibited except by permit obtainable from the harbor department.

Supplies.—Water, provisions, and ship chandlery can be obtained. Gasoline and distillate are available and there are provisions for bunkering large vessels with fuel oil. There are no facilities for coal bunkering.

There is a **chart agency** of the U. S. Coast and Geodetic Survey situated here.

Repairs.—There are good machine shops here, but no drydocks except for vessels under 250 tons displacement.

Communication.—Everett is served by 3 lines of transcontinental railroads and is a port of call for coastwise steamers. Many foreign-bound vessels call to load lumber. There are radio, telegraph, and telephone facilities. It is on the Pacific Highway. Bus service is maintained to Vancouver, British Columbia, and to Seattle.

Everett Airport is located about 3 miles northward of the center of the city, and lies between Steamboat and Union Sloughs on the eastern side of the State paved highway.

Port Series No. 28 covers the Port of Everett.

Storm warnings are displayed day and night by the Weather Bureau from a steel tower on the inshore end of Pier 2.

Snohomish River.—The Snohomish River borders the city on the north and east and enters Port Gardner after flowing southward across the flats west of the city and inside of the controlling dike. The project provides for a channel 8 feet deep from the lower harbor to the gap in the dike opposite **Preston Point** with a settling basin 1,200 feet long, 700 feet wide, and 12 feet deep in the vicinity of the Fourteenth Street dock. In June 1942, the controlling depths were: From the lower harbor to the stilling basin 6.3 feet, in the stilling basin 3.2 feet, thence 0.6 feet to the gap. †In _____ 19____, the controlling depths in the channel were: _____

_____

The southern end of the dike is marked by a light shown from a black cylindrical house on white pile dolphin. Many sawmills are located on the river and a large amount of lumber is barged out. The Snohomish River and connecting sloughs, navigated only by light-draft local craft, are crossed by several highway and railway drawbridges.

Caution.—The flats of the river are reported as extending to the southward to a line joining Pier 1 to the eastern end of Gedney Island. Vessels backing away from Pier 1 are warned to use caution. A limiting range that just clears this shoal is the north side of the large white oil tank (Standard Oil) in line with the south side of a tall light-colored building (Medical Dental Building) uptown. The changeable and shoaling channel across the flats should not be attempted without local knowledge.

The flats at the mouths of **Ebey, Steamboat**, and **Union Sloughs** and eastward of **Priest Point** are log-booming grounds.

Gedney Island, locally known as **"Hat Island"** is 3.5 miles northwestward of Elliot Point. It is about 1.5 miles long in an easterly direction and 0.5 mile wide. The island is high, wooded, and prominent. From its eastern point a shoal extends eastward, the 5-fathom curve being at a distance of 0.8 mile. Foul ground extends 0.2 mile from the south side of the eastern half of the island. About midway along the southern side a sand and gravel company maintains a wharf.

Clinton, on **Randall Point,** about 2 miles southwestward of Gedney Island, is a village with a post office and a landing wharf, store and automobile tourist camp.

Columbia Beach, 0.5 mile southward of Randall Point, has a float landing, a ferry slip, and an automobile tourist camp. An automobile ferry from Mukilteo lands here.

Sandy Point, the southern point at the entrance of Saratoga Passage is a low spit, rising abruptly to an elevation of 100 feet, with bluffs on each side; the end of the point is marked by a light shown from a small white house. **Sandy Point Light** is 24 feet above water, and visible 8 miles. A landing pier 200 feet long is a short distance east of the light. A group of houses and a pier built out to 7 feet are a short distance west of the light.

Camano Head is the southeastern point of Camano Island. A shoal, with a rock bare at low tide, extends nearly 0.2 mile southeastward from the point. A buoy marks the shoal.

Tulalip Bay is a small cove on the mainland at the junction of Possession Sound and Port Susan, on the northern side of which are situated the village of **Tulalip** and the buildings of an Indian reservation. The bay is shoal, with rocks extending more than 300 yards southward and westward from the point on the north side of the entrance. A buoy marks the edge of the shoal water westward of the point at the south side of the entrance. A small boat yard, several small piers, dry at low

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

water, and a landing float, are located at Tulalip. A shingle mill with large log booming grounds is near **Mission** in the southern part of the bay.

PORT SUSAN

(CHART 6450)

Camano Island lies between Port Susan and Saratoga Passage; it is irregular in shape and 14 miles in length, the southern portion consisting of a long, narrow tongue terminating in Camano Head, 300 feet high. At its northern end it is separated from the mainland by sloughs, dry at low water. A highway bridge crosses the sloughs and rivers and there is a good system of highways on the island.

Port Susan, on the eastern side of Camano Island, has a total length of about 11 miles in a northwesterly direction, and a width of 2 miles at its entrance; it expands to a width of 5 miles at its head, terminating in flats, bare at low water, that extend over 3 miles. There are no important settlements. There is deep water throughout until nearing the head, where anchorage may be had off the extreme western edge of the flats in about 10 fathoms. Care should be used in approaching and anchoring, as the flats rise abruptly from deep water. A channel, dry at low tide, has been dredged over the flats to the **South Pass** of the **Stillaguamish River;** this is buoyed, privately maintained, and used by light-draft vessels at high water. The entrance to the South Pass is marked by a light and echo board on a pile dolphin.

Stanwood is located in a dairying and farming district, on the north side of the Stillaguamish River, at the junction of the South and West Passes.

SARATOGA PASSAGE

(CHART 6450)

Saratoga Passage, on the western side of Camano Island, is about 18 miles long in a northwesterly direction. At its entrance, between Sandy Point and Camano Head, it is 1.2 miles in width, widening to its upper end, where it expands into a basin 4.2 miles in diameter, connecting eastward with Skagit Bay. The depths decrease uniformly from 100 fathoms at the entrance to 17 to 18 fathoms at the head. There are few outlying dangers, and a mid-channel course is clear to the head.

There is considerable traffic in these waters, confined, as a rule, to small local steamers that take advantage of the shelter afforded in making their trips between ports on the waters of San Juan Archipelago and points on Puget Sound. There are several towns and settlements, but the majority are of little commercial importance, The principal exports consist of lumber, fish, and some farm produce; general merchandise is imported. The principal points have rail and telegraph communication and steamer connections.

Langley, on the eastern shore of Whidbey Island, about 1.2 miles westward of Sandy Point, is a banking town serving a farming community. There is a landing wharf built out to 11 feet with a float attached. Gasoline is available at the wharf. Tugboats often anchor off the beach between Langley and Sandy Point.

Saratoga, about 3 miles northwestward from Langley, is a small village with a store and automobile tourist camp.

Mabana, a village with a post office on the western shore of Camano Island, 2

miles northwestward of Camano Head, has a store and a landing wharf built out to 6 feet. Gasoline is available at the wharf.

East Point, on the eastern shore of Whidbey Island, 6 miles northwestward of Sandy Point, is a low sand spit about 300 yards long. **East Point Light,** shown from a small white house, is 20 feet above water, visible 8 miles.

Elger Bay, on the western shore of Camano Island across Saratoga Passage from East Point, is an open bight about 0.8 mile long and 1 mile wide. Tugboats anchor here in westerly and northwesterly winds. Elger Bay is becoming a resort site. A number of houses are along the shore at the head of the bay. No wharf nor supplies are available.

Lowell Point, with a bare bluff at the southern end, is the point on the western side of Elger Bay.

Holmes Harbor, the entrance to which is on the southern shore about 8 miles above Sandy Point, extends in a southerly direction for 5 miles, with an average width of 1.2 miles. The depths range from 30 to 40 fathoms, at the entrance, to 17 and 18 fathoms at the head, where anchorage may be had in muddy bottom. **Rocky Point,** the eastern point at the entrance is low, but rises rapidly to a hill 500 feet high. **Hackney Island,** low and of small extent, with several houses on it, lies 0.2 miles northwestward of the point, with which it is connected at low water. From the island a shoal, bare at extreme low water, extends 0.2 mile northwestward; a buoy marks the edge of the shoal.

In entering, round Rocky Point at a distance of 0.8 mile and follow a midchannel course to the head. The harbor is but little used.

Greenbank, a small farming settlement, lies on the western side of Holmes Harbor at the entrance. It has a post office and several tourists camps.

Freeland, is situated at the head of Holmes Harbor. It has a post office, a store, a small sawmill, and a landing wharf which is bare alongside at half tide. There is a log booming area at the head of the bay.

Several automobile tourist camps lie on the western shore of the harbor.

Camano is a small settlement on the eastern side of Saratoga Passage, about 3.5 miles northwestward of Lowell Point. It has a store, a roadside service station, a hotel, and telephone facilities. Gasoline is available to craft that can get in close to shore as there is no wharf. **Madrona** is a small resort about 2 miles northward of Camano. There is a small pleasure pier built out to about 6 feet at **Madrona Beach.**

Penn Cove indents the western shore of the basin at the head of Saratoga Passage and extends southwestward for about 3.5 miles, with an average width of a mile. The head of the cove is about 1.5 miles eastward of Point Partridge, the western extremity of Whidbey Island.

Snatelum Point is the southern point at the entrance to Penn Cove; a narrow sunken spit extending northward 0.5 mile, with ¼ fathom near its end. The spit is marked by a buoy at its northern extremity. **Long Point** is about 0.9 mile westward of Snatelum Point.

Blower Bluff is the northern point at the entrance to Penn Cove; it is the southern point at the entrance of Oak Harbor. It is bare, light-colored, high, and rounding. Rocks lie offshore 200 yards at places along the bluff. The shoal extending off the southwestern end of the bluff reaches almost ⅓ the distance across Penn Cove. Vessels should favor the southern shore when passing this shoal; otherwise, a midchannel course may be followed with safety. The cove affords good anchorage, muddy bottom, in 8 to 14 fathoms inside the entrance.

Coupeville, the county seat of Island County, is located on the southern shore of Penn Cove about 2 miles from the head. It has two hotels, telephone service, stores, garage, and a wharf built out to 12 feet. Gasoline and fresh water are piped to the wharf and diesel oil may be secured ashore. A freight vessel from Seattle and Everett calls here thrice weekly. A sunken rock, with a reported depth of 9 feet at low tide, lies about 200 yards northeastward of the wharf, nearly in line with the tangent at the entrance to Penn Cove on the north side. Vessels generally approach the wharf from the northwestward. Shallow-draft vessels with local knowledge can pass inside the rock to approach from the eastward.

San de Fuca is a small town on the northern shore about 0.5 mile from the head. It has a store, a post office, an automobile tourist camp, and a substantial wharf built out to 10 feet. Gasoline and diesel oil may be had at the wharf. **Coveland** is a small settlement at the head of the cove.

Oak Harbor indents the northern shore of Saratoga Passage, westward of Crescent Harbor; it is small, semicircular and about a mile in extent. The cove is shallow, with a narrow, winding channel. **Maylor Spit** extends northwestward from the eastern shore. **Forbes Point,** the eastern point at the entrance, is foul, with a rock, bare at low water, 0.5 mile southwestward from the point. This is marked by a buoy 400 yards southward from the rock.

The town of **Oak Harbor** serves a dairying, poultry, and farming district. It is located on the northwestern shore of the harbor across from Maylor Spit. It has a hotel, hospital, stores, and a machine shop which can handle minor repairs. A long substantial wharf, with 7 feet of water at the end, extends from the town, terminating across and near the end of Maylor Spit. Gasoline and fresh water may be obtained at the wharf and diesel oil ashore. A freight vessel from Seattle and Everett calls here. A considerable quantity of poultry products is shipped.

Crescent Harbor, immediately eastward of Oak Harbor, is a semicircular bight 2 miles in diameter. The entrance is between Forbes Point and **Point Polnell,** the latter low, with a shoal extending westward for 0.9 mile. Shoals marked by a buoy extend 0.6 mile eastward from Forbes Point. With these exceptions the harbor is clear and affords good anchorage in 10 to 11 fathoms, muddy bottom, but is exposed southward.

No directions are necessary; in entering, pass midway between Forbes Point and Point Polnell, which clears the shoals extending from these points.

Demock Point*, rounding, and rising rapidly to an elevation of several hundred feet back of the point, lies at the southern entrance to Skagit Bay about 1.8 miles southeastward of Point Polnell.

Utsaladdy is a small village on the northern shore of Camano Island about 1.2 miles northeastward of Demock Point. It has a store and highway filling station. Vessels may anchor just eastward of Utsaladdy in a small inlet between the shoal water of the flats and the shore in 3 to 6 fathoms, muddy bottom, with shelter from southerly winds.

SKAGIT BAY, SOUTHERN PART

(CHART 6450)

Skagit Bay, the southern entrance to which is between Point Polnell and Demock Point, is about 12 miles long in a west-northwesterly direction. The greater portion of

*Lat. 48° 15′.0, Long. 122° 31′.7: Chart 6450.

it is filled with flats, bare at low water, and intersected by numerous channels through which the Skagit River discharges. Along the shore of Whidbey Island, between it and the edge of the flats, is a narrow channel varying in width from 0.2 to 0.6 mile; the shore of the island is also shoal for a distance of 100 to 300 yards offshore.

The channel leading into **Skagit River** crosses the flats northward of Camano Island, where it is buoyed, and marked by two lights. This channel was improved by the Government, but has not been maintained in recent years. Owing to shoaling, this channel has been abandoned by traffic to **Mount Vernon,** and the **North Fork** is used instead. It is used to some extent for log towing. There is a **chart agency** of the U. S. Coast and Geodetic Survey situated in Mount Vernon.

From the northernmost point of Camano Island another channel, also buoyed, leads eastward across the flats and connects through **West Pass** and South Pass, described on page 337, with the head of Port Susan. This channel is used only by small launches with local knowledge.

Skagit Bay, northern part is described on page 296.

HOOD CANAL, NORTHERN PART

(CHART 6450)

The entrance to **Hood Canal** is at the lower end of Admiralty Inlet, between Foulweather Bluff and Tala Point, described on pages 317 and 318, about 10 miles southward of Marrowstone Point. It extends in a general southerly direction for about 44 miles and then bends sharply northeastward for 11 miles, terminating in flats bare at low water. The head of Case Inlet, in the southern part of Puget Sound is less than 2 miles from the head of Hood Canal. The shores are high, bold, and wooded, but logged off to a considerable extent, rising to a much greater height, particularly on the western shore, than in other parts of the sound. The water is deep as a rule, except at the heads of the bays and at the mouths of the streams. The chart is a sufficient guide for the purpose of navigation. The southern part of the canal is described on page 344.

The Olympic Loop Highway follows the western shore of Hood Canal, and a connecting highway to Port Orchard follows the southern shore of the southern part of the canal around The Great Bend. There are road connections with Port Orchard and with the Puget Sound highway system from all the settlements on the eastern shore of the canal. Most of the traffic is handled by trucks and automobiles. Since the improvement in highways the water traffic has decreased, until in 1933 there was only one small commercial freight vessel making irregular trips to Hood Canal above Port Gamble. Water traffic is in general confined to tugboats with log rafts, small boats, and pleasure craft. Along the shores are numerous small farming or lumber settlements, some with post offices and landing wharves. Hood Canal is becoming a favorite vacation resort, but most of the travel is by automobile. Numerous automobile camps have sprung up, particularly along the western shore.

The **tidal currents** in Hood Canal at times attain velocities exceeding 1½ knots. At times, there are heavy tide rips northward of and around Foulweather Bluff, sufficiently heavy to be dangerous to small boats and to break up log rafts. This is most pronounced when the ebb current from the main body of Puget Sound meets that from Hood Canal off the point, and particularly so with the ebb against a strong northerly or northwesterly wind. Off Point Hannon and Hazel Point, tide rips occur at times sufficiently strong to be troublesome to tugboats with log tows. Current observations

taken at a station in mid-channel eastward of Hazel Point show that directions of both flood and ebb vary considerably at that location. At times, southwesterly winds from Hood Canal and northerly winds from Dabob Bay cause a chop dangerous for small boats. Under these conditions smoother water is found near either shore.

Sailing **directions** are not considered necessary. The dangers are few and generally close inshore. A number of low sand spits from 100 to 300 yards long are difficult to see at night, but many of them have been made into resorts and the buildings nearby show up well against the background of trees. Flats off the mouths of streams extend as much as 0.5 mile offshore and are extensive at the heads of some of the bays. When rounding Point Hannon, keep Snake Rock Light well open past Tala Point, or keep the power plant at Termination Point, which is lighted at night, open past the southern end of Hood Head. A midchannel course is clear until reaching The Great Bend, where the canal turns eastward. Here, the northern shore just eastward of Ayres Point should be favored to clear the flats extending from the eastern part of Annas Bay. The chart is the best guide.

Foulweather Bluff, the eastern point at the entrance to Hood Canal, is described on page 317.

Twin Spits are two long, low sand points, 0.5 and 1 mile southward of Foulweather Bluff. When waiting for smooth weather to round Foulweather Bluff, tugboats with log tows often anchor in 8 fathoms, 1 mile southeastward of the southern spit, in a bight locally known as **"Races Cove"**, with Colvos Rock Light slightly clear of the end of the southern point of Twin Spits.

Hood Head, on the western side of Hood Canal and 3 miles southward of the entrance, is practically an island, having only a long narrow strip of low sandy beach connecting it with the western shore. The head is 210 feet high, steep and wooded, and is a prominent feature when viewed from the entrance.

Point Hannon, locally known as **"Whiskey Spit"**, is a low sandy spit, more than 300 yards long, extending eastward from Hood Head. Shoal water extends about 150 yards from the spit.

A 6-foot shoal, marked by some kelp, extends more than 300 yards southward of Hood Head. **Bywater Bay** (chart 6412) is a small cove between Hood Head and the western shore.

Shine, a village on **Termination Point** about 1.7 miles southwestward of Point Hannon, is the western landing of the Salsbury Point-Shine automobile ferry across Hood Canal, which connects with the Olympic Loop Highway. There are a transformer substation, lighted at night, on the point, and a submarine cable across the canal to Salsbury Point.

Sisters are two rocks a little over 200 yards apart, 0.5 mile southward of Termination Point. The rocks are awash at about half tide. There is a white triangular daymark on the southern rock. They are about 0.4 mile from the northern entrance point to **Squamish Harbor,** a small, open bight just southwestward of Termination Point. Towboats frequently anchor near the head of the harbor in about 6 fathoms, muddy bottom.

Case Shoal, partly bare at low water, lies about 0.6 mile from and parallel with the western shore of Squamish Harbor. It is about 1 mile long and its northern end is 0.5 mile from the northern shore of the harbor.

Port Gamble (**chart 6412**) is a small inlet on the eastern shore of the canal, 5 miles

from the entrance. It is 2 miles in length, with an average width of over 0.5 mile and a contracted entrance.

A channel, 150 feet wide and 30 feet deep has been dredged through the narrow entrance to Port Gamble. A lighted range, astern when entering, is about 0.9 mile northward of the outer end of the channel. The front mark has a white square daymade and red vertical stripe. The rear mark has a white diamond daymark with a red vertical strip. The azimuth of the range is 359½° true. The lights are visible only on the range. The channel is marked by two lights on pile dolphins on the eastern side. The southern one of these lights lies some distance away from the edge of the channel. In January 1933 the controlling depth was 28 feet. † In _____ 19_____, the controlling depth in the channel was _____ feet. The channel depth is subject to change.

Port Gamble lies on the western shore at the entrance. It is a mill port which ships considerable lumber. There are hotel, hospital, and telephone and telegraph facilities. The large mill wharf has ample depths for ocean vessels, and fresh water is piped to the berthing face. A ballast pile, nearly bare at low tide, lies southward from the mill. The town landing wharf, suitable for small vessels, is on the northern side of the town. A 6-foot shoal is reported about 80 yards northeastward from the north end of the town landing wharf. There are rocks baring at low tide on the southern side of the wharf. Diesel oil and gasoline may be obtained in limited quantities from the town wharf, and provisions are obtainable. Supplies of all kinds may be obtained on short notice from Seattle, as a small freight vessel from that port stops here daily.

Excellent anchorage may be had in the bay in 24 to 54 feet, muddy bottom.

Directions.—Vessels should hold a midchannel course, **179½°**, on entering until 200 yards or more past the southern light, and then head for the wharf, keeping the long eastern face open to avoid shoal water on the western side of the channel. In entering the bay, care should be taken not to work too far to the eastward when passing the mill wharf. A sand spit, partly bare at low water, extends from the point in front of **Indian Village** almost to the edge of the dredged channel, or about half way to the mill wharf.

Caution.—Several vessels have grounded on the sand spit 1½ miles northward of the town. The entrance lights are easily confused with lights in the Indian Village.

An automobile ferry crosses Hood Canal from **Salsbury Point,** about 1 mile westward of Port Gamble, to Shine, on Termination Point, with bus connections to Port Ludlow.

Lofall on the eastern shore about 8 miles southward of the entrance to Hood Canal, is a settlement with landing wharf, post office, store, and highway filling station. A road leads to Port Gamble and to Poulsbo, on Liberty Bay, and connects with the Puget Sound highway system.

Bangor is a village with a post office, on the eastern side of Hood Canal about 14.5 miles southward of the canal entrance. It has a landing wharf on the northern side of King Spit built out to 11 feet, a store, highway filling station, and a small clam cannery. A road leads to Poulsbo, on Liberty Bay, and connects with the highway system of Puget Sound. **King Spit,** a low, sandy point at the southern side of the town, affords some protection from southerly weather for boats at the wharf, and for small boats anchored just northward of the spit.

Seabeck, about 21 miles from Hood Canal entrance, is a settlement and summer resort at the head of **Seabeck Bay**, a small cove on the eastern shore. There are a landing wharf with a depth of 14 feet alongside, a store and a post office. An automobile

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

ferry crosses the canal with a landing on the western shore just southward of Brinnon. A road leads to Bremerton over which is a daily bus service.

A logging camp is situated on the western shore of Seabeck Bay, off which numerous piles are driven for a log dump. Log booming operations are carried on to the westward of the ferry landing. Shoal water extends 0.5 mile from the head of he bay. Good anchorage, well protected from southerly and southeasterly weather, is afforded in the bay in 5 to 10 fathoms. Shoal water extends more than 200 yards off **Misery Point,** at the western side of the entrance to the bay.

Oak Head about 1.8 miles northward of Misery Point is the southernmost point of **Toandos Peninsula. Hazel Point,** 1.8 miles northeastward of Oak Head, is the southeastern point of the peninsula, and the turning point where the canal bends sharply from southward to southwestward. **Tskutsko Point,** 1 mile westward of Oak Head, is the southwestern point of Toandos Peninsula, and is at the east side of the entrance to Dabob Bay.

Fisherman Harbor is a cove on the southern end of Toandos Peninsula, just eastward of Oak Head. It is about 200 yards wide, 0.8 mile long, and has a restricted entrance which is practically bare at low water. A sand spit extends partly across the entrance from the western shore. It affords sheltered anchorage for small boats. **Coyle,** a small settlement, is situated on the eastern shore of the cove.

Brinnon is a village on the southern side of **Dosewallips River,** about 3.5 miles westward of Oak Head, at the entrance to Dabob Bay. There are automobile camps, a post office, hotel, store, highway filling station, and a landing wharf built out to 7 feet. The wharf is located at the southern end of Dosewallips River Flats, which extend 0.5 mile offshore and are bare at low water. Shoal water is found in line with the face of the wharf off both ends. The Seabeck-Brinnon automobile ferry landing is about 0.5 mile southward of the Brinnon Wharf.

Dabob Bay, the largest inlet in the canal and separated from it by the Toandos Peninsula, extends 9 miles in a northerly direction. The entrance is between Tskutsko Point and **Sylopash Point** just northward of the mouth of the Dosewallips River. A small cove, **Jackson Cove,** between **Wawa** and **Pulali Points,** and a small inlet, **Quilcene Bay,** westward of **Bolton Peninsula,** indent the western shore. There is a Boy Scout camp, with a landing wharf, on the western shore of Jackson Cove. The western shore of Dabob Bay is particularly steep and bold, reaching an elevation of over 2,600 feet in less than 2 miles from the coast.

Quilcene is a village with a post office at the mouth of **Big Quilcene River,** on the western side and near the head of Quilcene Bay. It is on the Olympic Loop Highway, and has stores, garages, hotel, automobile camps, highway filling stations, and a shingle mill.

Pleasant Harbor is a small cove on the western shore of Hood Canal, about 3 miles westward of Misery Point. It is about 300 yards wide, 0.5 mile long, and has a narrow, shallow entrance. Inside, there is sheltered anchorage for small boats, with a maximum depth of 6 fathoms. A large log dump and log boom are in the harbor.

Duckabush, just westward from **Quatsap Point**, about 5 miles southwestward of Oak Head, is a settlement on the western shore, at the head of a shallow bay which is mostly dry at low water. There is a store, highway filling station, and automobile camp, but no landing wharf. A large log dump and log boom are in the bight.

Triton Head, on the western shore, is about 8.2 miles southwestward of Oak Head. It is low, rocky, and timbered, with a reef, bare at low water, extending about 200 yards northward from the point. **Triton Cove** is a small cove formed by the head and

the western shore, which affords anchorage for small vessels, with some protection from southerly winds. Oyster beds, marked by stakes and brush, are located about 0.8 mile northward from Triton Head on the flat which extends off the mouth of **Fulton Creek.**

HOOD CANAL, SOUTHERN PART

(CHART 6460)

Holly, on the eastern shore of Hood Canal, is a settlement on the southern side of a small bight about 10 miles southwestward of Oak Head. It has a landing wharf built out to 10 feet, a store, highway filling station, and automobile tourist camp, and road connections with the Puget Sound highway system. Shoal water extends about 300 yards from the shore northward and eastward of the wharf. It is reported that a boulder, baring at extremely low tides, projecting 3 to 4 feet above the surrounding shallow bottom, lies about 0.2 mile northward of the wharf and 300 or 400 yards from the shore. Vessels should approach the wharf from the westward. Shoal water extends about 0.3 mile north-northwestward from the northerly point of the cove in which Holly is located. **Anderson Cove** is the shallow cove directly northward of Holly.

Eldon is a settlement on the western shore situated on the southern bank of the **Hama Hama River,** about 12.5 miles southwestward of Oak Head. It has a store, and automobile tourist camps. The flats from Hama Hama River extend nearly 0.5 mile from the shore. An abandoned logging wharf, in ruins, is located at the southern end of the flats.

Lilliwaup, a village with a post office, is situated on the southern shore of **Lilliwaup Bay**, a small shallow cove on the western shore of Hood Canal about 18 miles southwestward of Oak Head. It has an automobile tourist camp. Small-scale logging operations are carried on nearby to the southward.

Dewatto is a small settlement on the southern side of **Dewatto Bay,** a small, shallow cove on the eastern shore opposite Lilliwaup. It is connected with the highway system of Puget Sound. There is a log boom in the bay.

Hoodsport is the largest town on Hood Canal. It is situated on the western shore about 21 miles southwestward of Oak Head. It has two hotels, stores, school, telephone connections, garages, automobile tourist camp, a small sawmill, and a landing wharf with 14 feet alongside. Gasoline may be obtained on the wharf by truck delivery. Just southward and considerably outside the end of the wharf, the flats from a creek are bare at low water for about 300 yards. Vessels should approach the wharf from eastward to northeastward. The dolphins just southward from the wharf, and the landing at the sawmill, are bare at low water. A bus road leads to Lake Cushman, a much frequented summer resort, about 9 miles distant.

Potlatch is a logging town on the western side of the canal about 2 miles southward of Hoodsport and opposite **The Great Bend,** where Hood Canal turns northeastward. It has a post office and a substantial wharf with 15 feet at low water along the face of it. There are log booming grounds on both sides of the wharf and a log dump southward of the wharf. The company operates a store, hotel, and machine shop; gasoline may be obtained at the wharf. Bus connections are made with Bremerton, Port Orchard, Brinnon, and Shelton. Telephone facilities are available.

Union is a town on the southern shore of the Great Bend. There is a float-landing and a small wharf. Boats should approach the landing from northeastward and look out for snags. Gasoline may be obtained at the landing. The water alongside the float is reported to be of sufficient depth for small boats at all stages of the tide. The town has a hotel, post office, two stores, and an automobile tourist camp.

Annas Bay lies immediately westward of Union and is a broad, open bight, the eastern half being a flat, bare at low water. This flat extends about 0.2 mile into the canal immediately westward of Union and is formed by the **Skokomish River,** which empties at the head of the bay.

There are no settlements of importance eastward of Union.

Hood Canal terminates in **Lynch Cove,** with flats, mostly bare at low tide, about 2.2 miles from the head. **Union River** empties into Lynch Cove. Gasoline may be obtained at **Happy Hollow** about 3 miles from the head. Oyster beds are on the flats.

Many resorts, auto camps, and summer cottages have been built along the shores of Hood Canal. Many of the resorts have small piers and boat landings.

PORT ORCHARD, NORTHERN PART

(CHART 6443)

Port Orchard is an extensive body of water lying westward of Bainbridge Island. Its general length is about 15 miles with an average width of over 0.8 mile. At its northern end it connects with Port Madison through Agate Passage. At its southern end Port Orchard connects with Puget Sound through Rich Passage. The depths in the main body of Port Orchard range from 36 to 150 feet with but few dangers, and these as a rule close inshore. The shores are moderately low and wooded.

The country around Port Orchard is rapidly being settled and many towns and villages, most of which have landing wharves for shipment of farm produce, have sprung up in recent years. These are being constantly added to; the principal ones in existence at present are mentioned below. Many are in communication with Seattle by daily steamer, telegraph, and telephone.

Current observations taken in midchannel about 1 mile southward of Tolo Wharf indicate that the tidal current in that locality is very weak.

Agate Passage is the northern entrance to Port Orchard and forms a connection with Port Madison, described on page 320. The channel extends about one mile in a northeasterly direction and averages about 380 yards in width. The controlling depth is about 20 feet. The passage is straight; the shores are wooded and fairly steep-to; the shoreline is for the most part rocky, and fringed with kelp to Point Bolin. The currents have velocities up to 6 knots; the flood sets southwestward and the ebb northeastward.

The passage is obstructed by a shoal near the middle of the northern end with depths of 9 to 10 feet, and there are other depths of 14 to 18 feet almost in midchannel. It has been examined by wire drag and the dangers are shown on the chart.

The northern entrance is marked by **Agate Passage Light,** shown from a white house on piles, on the western side of the channel opposite **Agate Point;** also, by a buoy on the western side of the channel. The southern entrance is marked by a buoy on the western side of the channel.

Seabold, a village with a post office on Bainbridge Island, is situated about 0.5 mile southward of the southern entrance to Agate Passage. There is no wharf at this village.

Sandy Hook, is a home development about 0.8 mile northward of **Point Bolin,** the southern point of Agate Passage. There is a wharf located here.

Liberty Bay, also known as **Dogfish Bay,** is a narrow inlet extending about 4 miles in a northwesterly direction from the northwestern part of Port Orchard. The bay averages about 0.5 mile in width, the southeastern half being narrow and tortuous.

The shores are low and wooded; the shoreline is mostly sand and gravel. There are mudflats at the head of the bay and in the small bights on the southern side of the bay. Mud is the predominating bottom characteristic. The current north of Keyport, in the narrow entrance to the bay, is said to have a velocity at strength of about 2½ knots. A 16-foot shoal lies about 350 yards northwestward of the northern tower of the overhead cable crossing at Keyport.

A naval torpedo station is located on the western side of the entrance to Liberty Bay. There are two wharves at the **Keyport Torpedo Station.** No. 1 is built out to 19 feet and No. 2 is built out to 26 feet. The towers of the radio station are prominent and there are several prominent buildings on the reservation.

Torpedo warning.—A red flag hoisted on the south wharf at the torpedo station and one displayed on the southern lighter indicate that torpedo firing is in progress and vessels are to keep well to the east of the channel clear of the range, marked by white buoys, keeping a sharp lookout for torpedoes.

Keyport is situated on the southern side of the passage leading to Liberty Bay. It has a landing wharf built out to 17 feet and is in communication with Seattle and neighboring points by several daily trips of a passenger and freight vessel. An electric transmission line crosses the passage at Keyport, with a vertical clearance of 90 feet.

Lemolo is a village with a post office situated on the eastern side of Liberty Bay.

A rock with little water over it at low tide, lies 150° from the southwestern corner of the dock which is located about midway between Lemolo and Poulsbo, on the eastern side of Liberty Bay.

Pearson, a village with a post office on the southern shore of Liberty Bay, has a landing wharf, with 8 feet, built out from the end of a low point.

Scandia, about 0.3 mile westward of Pearson, has a wharf out to 7 feet.

Poulsbo, a town on the east shore at the head of Liberty Bay, has several wharves with from 8 to 12 feet at low water, and is the center of an extensive fishing industry. A saltery, a sawmill, and a boat yard are located here. Provisions may be had and fuel oils are obtainable at a small oil dock. A road connects Poulsbo with Bangor and other settlements on Hood Canal. There is a large area of farming country around Poulsbo and extending toward Hood Canal, and a considerable amount of produce and lumber is shipped. Oysters are cultivated on the flats at the head of the bay.

Manzanita, a small settlement with a wharf with 6 feet alongside, is on the western side of Bainbridge Island in a small cove located about 1.5 miles southward from Seabold. **Manzanita Bay,** southward of the town, affords an excellent anchorage for small craft in 27 feet, mud bottom.

Battle Point, a sandy spit, is on the eastern side of Port Orchard about 1.7 miles southward of Point Bolin; it marks the turn in the direction of the channel from southwest to southward. **Battle Point Light** is shown from a white house on piles located off the end of the spit. The light is 25 feet above water, and visible 9 miles. There is a small lagoon southeastward of the point.

Brownsville, on the western shore of Port Orchard, is situated on the northern shore of Burke Bay, about 1.2 miles southwestward of Battle Point. The town has a landing wharf built out to 10 feet combined with a ferry slip from which a ferry crosses to Fletcher Bay. All of **Burke Bay** bares at low water, but it may be entered by small boats at about half tide.

The southern part of Port Orchard is described on page 347.

Chapter 18.—PUGET SOUND, SEATTLE TO OLYMPIA

(CHART 6460)

PORT ORCHARD, SOUTHERN PART

(CHART 6444)

The northern part of Port Orchard is described on page 345. Restoration Point is described on page 323.

From Restoration Point the shore of Bainbridge Island trends southwestward for about 2 miles to **Beans Point***, the north point at the entrance to Rich Passage. Between the points the shores are thickly settled with summer cottages, which are served by **South Beach** Wharf, built out to 12 feet, about 1.2 miles southwestward of Restoration Point.

Bainbridge Reef, with depths of 36 feet at the outer end and deeper water inside, extends 0.4 mile southward from the shore between South Beach wharf and Beans Point, and constitutes the principal danger in the approach to Rich Passage for deep draft vessels. Its outer end is marked by a lighted bell buoy.

Orchard Point, the southern point at the entrance to Rich Passage, is marked by a light, shown from a white pyramidal tower. **Orchard Point Light** is 34 feet above the water, and visible 11 miles. The fog signal is sounded on a reed horn.

Blake Island lying about 2.5 miles southwestward of Restoration Point is described on page 352.

Port Orchard is connected with Puget Sound by **Rich Passage,** at the southern end of Bainbridge Island, which is the principal entrance to Port Orchard, and the one in general use. The approach to the passage is between Restoration Point and Blake Island, and is deep and free from dangers except for Bainbridge Reef.

Rich Passage is about 3 miles long, with a rather sharp bend near its western end, and varies in width from 0.8 mile at its eastern end to a little more than 0.2 mile at the western. It has been examined by means of the wire drag and the dangers are shown on the chart. **Orchard Rocks,** 500 by 350 yards in extent, lie on the northern side of the channel just inside the eastern entrance. A small area near the center of the reef is bare at low tide; the highest point covers at about half tide and is marked by a white echo board, faces northeast-and-southwest. The rocks are marked by a lighted buoy 400 yards southward from the echo board. The reef off **Point Glover** is marked by a light, shown from a small white house on pile structure; a fog signal is sounded on an air diaphragm horn. **Waterman Point,** at the western entrance, is marked by a light, shown from a white square house on black cylindrical base; a fog signal is sounded on an air diaphragm horn. A day range, bearing 319½°, leads over the best water off Point Glover; the front mark is a white square and the rear mark is a white diamond; each has a red vertical stripe.

*Lat. 47°34′.5, Long. 122°31′.2: Charts 6444, 6460.

A lighted buoy marks the southern edge of the shoal extending from **Point White,** the north point at the western entrance to Rich Passage.

Currents.—Continuous hourly observations for about one month at a station located in midchannel about midway between Point Glover and Point White, and similar observations for shorter periods at various other points in the passage indicate the following:

At this station the strongest currents which have been observed are about 4 knots on the flood and 5 knots on the ebb. The average maximum velocity of the flood current is about 2½ knots and of the ebb 3 knots.

Near the time of slack water, the average period when the current velocity does not exceed ¼ knot is about 20 minutes. For strong currents these periods will be decreased, and for weak currents they will be increased.

In the channel between Pleasant Beach and Point Glover the average velocity of the flood at strength is about 1¼ knots and of the ebb about 2¼ knots.

North-northwestward of Orchard Rocks the average velocity of the flood stream is about ½ knot, and the velocity of the ebb about 2 knots.

The flood stream through the passage is of a simple and regular character. The stream lines are nearly uniform in trend from shore to shore, except off the bight just northwestward of Middle Point and in the large cove on the northern shore opposite Point Glover, where eddies occur. These eddies, however, are both of limited extent, neither extending outward to the usual steamer track. This regularity tends to increase the actual or available cross section of the flood stream and consequently to diminish its strength.

The funnel-shaped configuration of the passage is not favorable to the production of regular stream-line motion on the ebb current, and extensive eddies and countercurrents occur.

Between Middle Point and Point Glover, an extensive eddy extends from shore almost to midchannel, and will frequently be encountered by vessels on the track between Orchard Rocks and Point Glover buoys.

An eddy fills the cove on the northern shore opposite Point Glover, but does not extend outward to the steamer track.

An eddy occurs about 0.2 mile south-southwestward of Point White and a little northward of midchannel at the western entrance to the passage.

A weak countercurrent occurs inshore along the southeastern side of Point White.

These eddies and countercurrents on the ebb greatly diminish the effective cross section of the passage, and so increase the velocities in the channel. They also increase the duration of the ebb stream and diminish that of the flood, this inequality being much more pronounced in the eastern portion of the passage than in the western.

Directions, Port Orchard.—Strangers should not attempt to navigate Port Orchard, and particularly Rich Passage, in thick weather, on account of the strong tidal currents. In clear weather, however, the navigation of these waters presents no difficulty. Enter between Restoration Point and Blake Island, giving either shore a berth of not less than 0.5 mile, and steer so as to pass 300 yards southward of Bainbridge Reef lighted bell buoy. From a midchannel position between that buoy and Orchard Point Light, steer **310°** heading for Middle Point, to pass 200 yards southward of Orchard Rocks lighted buoy. When the buoy is abeam, steer **000°** for 0.75 mile until nearly up to buoy, then haul on to the range, bearing **319½°** holding a little southward of it. When abeam of Point Glover Light follow mid-channel courses to Waterman Point Light. From this

point a **225°** course for 2.3 miles leads to a position with Point Herron Light abeam, distance 0.3 mile. Then steer **247°** for 1.5 miles to the anchorage off the navy yard.

Caution.—Rich Passage, because of activities at the Puget Sound Navy Yard, has a very large volume of traffic. More than thirty ferries a day each way, numberless tugs with hawser tows, and various types of naval craft, all contribute to create a considerable collision hazard in the passage, particularly at the sharp bend off Point Glover. Strong tidal conditions prevail in this vicinity, and naval authorities call attention to the fact that deep-draft outbound government vessels making the sharp turn are usually unavoidably set well over toward Buoy No. 8, necessitating a two-blast, starboard-to-starboard meeting with inbound vessels. There is, accordingly, a well-established local custom to regard navigation at this bend as a special circumstance situation subject to the provisions of *Articles 27 and 29, Inland Rules.* Outbound vessels should give notice of their approach by sounding one long blast of the whistle when within half a mile of Point Glover, or approximately at Point White Buoy No. 10, as provided in *Article 18, Rule V, Inland Rules*, to be answered with a similar long blast by any inbound vessel nearing the bend. To avoid accident, inbound vessels should approach the bend with great caution, preparing to pass an outbound vessel in accordance with the latter's proposed signals, two short blasts signifying intention of the outbound vessel to pass starboard-to-starboard and one short blast signifying her intention to pass port-to-port. The appropriate passing signal should be given by the outbound vessel and answered by the inbound vessel as soon as practicable after sighting each other.

There are many towns and villages along the shores of Port Orchard, many of which have landing wharves for shipment of farm produce. Many have daily communication with Seattle by steamer, and telephone and telegraph service.

Fort Ward is a naval post on Bainbridge Island near the eastern entrance to Rich Passage, just inside Beans Point. There is a wharf built out to 18 feet. A rocky patch, with 13 feet over it, dangerous to vessels approaching the wharf from southward, lies 150 yards 170° from the southeastern end of the wharf.

Pleasant Beach is a summer resort on the northern shore of Rich Passage, about a mile northwestward of Fort Ward. The landing wharf is in ruins.

Waterman, a village with a post office, on the southeastern shore of Port Orchard about a mile southwestward from Rich Passage, has a landing wharf built out to 13 feet. **Enetai,** with a landing wharf built out to 13 feet, is a community of summer cottages situated on the western shore opposite Waterman.

Gibson, a small settlement on the eastern shore of Port Orchard, about 0.8 mile northwestward of Point White, has a landing wharf. **Crystal Springs** and **Westwood** are small settlements on the eastern shore, 0.5 mile and 1.1 miles, respectively, northward of Gibson. They have no landing wharves.

Illahee and **Gilbertson** are small settlements with landing wharves, the former built out to 15 feet, on the western shore opposite Crystal Springs and Fletcher Bay, respectively.

Fletcher Bay, a village with a post office, is situated on the eastern shore of Port Orchard about 1.2 miles southeastward of Battle Point. It has a combination landing wharf and ferry slip. An automobile ferry crosses to Brownsville on the western shore. Small boats can enter Fletcher Bay at ¾ tide and find anchorage in 12 feet, mud bottom; the swinging room is limited. The bar across the entrance to the bay bares at half tide.

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SINCLAIR INLET

(CHART 6440)

Sinclair Inlet, about 3.5 miles long and averaging a mile in width, makes in southwestward beyond Port Washington Narrows, and is the principal inlet in Port Orchard.

Point Herron, at the junction of Port Orchard, Sinclair Inlet, and Port Washington Narrows is marked by **Point Herron Light,** shown from a platform on pile dolphin in 21 feet, southward of the point. The light is 24 feet above water; a fog signal is sounded on an air horn.

East Bremerton (**Manette, P. O.**) lies on the eastern side of the entrance to Port Washington Narrows. A fixed bridge with a clear span of 231 feet and a vertical clearance of 80 feet crosses Port Washington Narrows to Bremerton, about 0.3 mile northward of **Point Turner.** There are several wharves and a ferry slip at East Bremerton. Communication is maintained with Seattle by several boats and ferries daily. There is bus service to Tacoma and neighboring towns.

A soldiers' home for Washington veterans, with a landing wharf built out to 24 feet, is located on the southern shore of Sinclair Inlet, about 1.2 miles southward of Point Herron. **Retsil** is the post office. **Annapolis,** a small settlement, is located on the shore just westward of the wharf at the **Veterans Home.**

Port Orchard lies on the southern shore of Sinclair Inlet opposite the navy yard. It has a city wharf built out to 27 feet, with a ferry slip attached, an oil wharf with 10 feet alongside at which small boats can obtain gasoline, and several small private landings. Ferry and freight service is maintained with Bremerton and Seattle.

A flat, largely bare at low tide, extends 0.4 mile from the shore of the bight eastward of Port Orchard. A buoy marks the edge of the shoal. Shoal water extends about 100 yards outside the line between the ends of the city wharf and the long wharf eastward of it.

Puget Sound Navy Yard is situated on the northern shore of Sinclair Inlet, on the western side of the entrance to Port Washington Narrows.

Warning signal.—A triple combination air horn has been installed on the 250-ton erecting crane at the outer end of Pier 6. Vessels are warned to run at slow speed when within 0.8 mile of the pier if signal is blown.

Bremerton, the principal city on Port Orchard, is located on the northern shore of Sinclair Inlet, adjoining the navy yard; East Bremerton is included in the city limits. Communication is maintained with Seattle and Tacoma by daily steamer service and by highway connections.

PORT WASHINGTON NARROWS AND DYES INLET

(CHART 6444)

Port Washington Narrows, a narrow passage about 3 miles with an average width of 0.2 mile, connects Sinclair and Dyes Inlets. It is estimated that currents running fair with the channel reach a velocity of 4 knots in certain parts of the narrows. There are four day ranges for navigating Port Washington Narrows northward of the bridge. On the ranges, 14 feet can be taken through the narrows; with local knowledge, a slightly greater depth can be carried by deviating slightly from the ranges.

An oil wharf, built out to 15 feet, is located on the western shore of Port Washington Narrows about 0.2 mile above the bridge. Gasoline and diesel oil can be obtained.

Anderson Cove is a small bight on the south shore about 1.5 miles above the bridge. As there is little or no water small boats anchor off the cove. There is a small boat mooring and service station here. **Sheridan**, on the eastern shore of the narrows about 2 miles above the entrance, has a landing wharf. **Phinney Bay**, about 0.4 mile wide and 0.8 mile long, makes into the western shore opposite Sheridan.

Rocky Point is on the western side of the northern entrance of Washington Narrows. There are tide rips off this point.

Dyes Inlet is about 3 miles long and averages a mile in width. A number of towns are situated on the shores of the inlet. There is ferry service to Bremerton and Seattle.

Tracyton, a village with a post office is situated on the eastern shore of Dyes Inlet near the northern end of the narrows. It has a landing wharf with 12 feet.

Fairview, on **Windy Point**, about 1.2 miles northwestward of Tracyton, has a small landing wharf with 12 feet of water.

Silverdale is a town on the western side at the head of Dyes Inlet. It has two wharves built out to 10 feet. Gasoline, water, and supplies may be obtained here. There are several stores and a hotel in the town.

Chico is a town with a landing wharf located on western side of Dyes Inlet. There is 14 feet of water at the end of the wharf. Considerable logging operations are carried on in this locality.

Ostrich Bay is an inlet in the southwestern part of Dyes Inlet. **Erland** is a small settlement on the western shore at the entrance. A sunken rock is reported in Ostrich Bay 250 yards, 10° from the end of the dock on the western shore.

A depth of 6 feet can be carried from Ostrich Bay into **Oyster Bay** with mid-channel courses. There is 6 feet or more in Oyster Bay. **Mud Bay**, a narrow slough eastward of Ostrich Bay, bares at low water.

ALKI POINT TO COMMENCEMENT BAY

(CHART 6460)

East Passage, on the eastern side of Vashon and Maury Islands extends from Alki Point southeastward for 12.5 miles to Robinson Point, thence southwestward a distance of 6 miles to Brown Point. The waters throughout are deep and free of dangers, which in no case extend as much as 0.5 mile from shore.

From Alki Point*, described on page 324, to **Point Williams**, 3 miles, the shores are thickly settled. **Fauntleroy Cove** lies between Point Williams and **Brace Point**, 1 mile southward, and is included in the city limits of Seattle. There is an automobile ferry from Fauntleroy to Vashon Heights and Harper.

From Orchard Point, described on page 347, the shores trend southward and then eastward, forming, with the south shore of Bainbridge Island, a bay, semicircular in form and about 3.5 miles in diameter.

Manchester, Colby, South Colby, Harper, and **Southworth** are small towns on the shores of this bay, between Orchard Point and Point Southworth, at the entrance to Colvos Passage. Manchester has a combination ferry slip and landing wharf built out to 14 feet, with fresh water piped to the end. A row of lights on the wharf is prominent at night. There is a small launch-building plant at Colby. The South Colby Wharf is in ruins. There is no wharf at Southworth. Harper has a combination ferry slip and landing wharf built out to 12 feet. A row of

*Lat. 47°34′.6, Long. 122°25′.2: Charts 6450, 6460.

lights on the wharf is prominent at night. A passenger and freight vessel calls from Seattle.

Blake Island, about 1 mile in extent, 160 feet high, and covered with trees, lies in the southeastern part of this bay, off the northern entrance to Colvos Passage. Heavy tide rips, strongest with flood tide and strong southerly winds, are encountered at the northern entrance to Colvos Passages southward of Blake Island. Shallow, irregular bottom extends about 0.5 mile off the northern shore of the island. There is a dock built out to 14 feet just southward of the northeastern point of the island.

Colvos Passage, separating Vashon Island from the mainland westward, is described on page 354.

Yukon Harbor, about 2 miles southwestward of Blake Island, affords anchorage in 6 to 10 fathoms, with protection from southerly winds.

Vashon Island is 11 miles long in a northerly direction and has an average width of about 3 miles.

Maury Island, which is really a part of Vashon Island, the two being connected by a narrow neck of land which bares at high water, lies off the eastern side of Vashon Island, and is 5 miles long, with an average width of 1 mile.

On these islands the land is of moderate elevation, rolling, and in places rugged, and the country throughout is heavily wooded except for the numerous clearings where farming is in progress. The shores on all sides have numerous settlements, wit wharves built out to accommodate the local traffic to Seattle or Tacoma. These settlements are mentioned in detail under the description of the waters following.

Point Vashon, the northwestern extremity of Vashon Island, is 280 feet high, steep, and wooded. Shoal water extends 0.2 mile northward from Point Vashon and nearly as far along the northern shore to **Dolphin Point,** 1 mile eastward.

Vashon Heights Landing, 0.5 mile eastward of Point Vashon, has a combination ferry slip and landing wharf built out to 14 feet. An automobile ferry runs to Harper and Fauntleroy and a freight and passenger vessel to Harper and Seattle.

Aquarium, on the eastern shore of Vashon Island, 0.5 mile southward of Dolphin Point, is a small settlement with a private landing wharf, locally known as **"Cowley's Landing."**

Glen Acres and **Dilworth,** on the northern and southern shores of **Point Beals** which lies 2.5 miles southeastward of Dolphin Point, are small settlements. The former has a landing wharf built out to 14 feet. Only a few pilings remain of the old landing wharf at the latter.

The ruins of an old landing wharf are located 1 mile southward of Point Beals. The town and post office of **Vashon** are on the high land 1.5 miles inland from the wharf.

Measured course.—There are ranges for a measured mile trial course on either side of Point Beals. The range marks are steel towers with round red and white targets.

Point Pully, about 7.8 miles southward of Alki Point, is a sharp, low spit, projecting 300 yards from the high land, which in 1 mile rises to 430 feet elevation. On the low part of the point is a grassy knoll 30 feet high, with three or more trees upon it, from which it derives its local name, **Three-tree Point.** Point Pully is marked by a light shown from a white skeleton structure, 20 feet above water. **Pully Point Light** has a fixed fog light of very high power, 25 feet above water, which is shown from sunset to sunrise and at other times of low visibility.

Point Heyer, a sand spit behind which the ground rises rapidly, lies about 2.5 miles southward of Point Beals. A shoal extends 0.2 mile southeastward from the point. A radio tower on this point is about 450 feet high.

Ellisport is a village with a post office just southward of Point Heyer. A few pilings of the old landing wharf remain.

Portage is a village with a post office and a hotel, on the northern side of the low isthmus which connects Vashon and Maury Islands. Just northward of the isthmus is an oil wharf built out to 29 feet. The wharf is used as an oil-distributing point for the interior of the island. Boats may obtain gasoline, but there are no service pipe lines to the end of the wharf. Two radio towers, about 526 feet high, are situated about 0.6 mile southward of the isthmus.

Robinson Point, the easternmost extremity of Maury Island, is a low spit projecting 140 yards from the wooded high land. It is the turning point in the East Passage and is marked by a white octagonal tower attached to fog-signal building. **Robinson Point Light*** is 40 feet above water, and visible 12 miles. The fog signal is sounded on a reed horn.

There are no landings on the southeastern shore of Maury Island. Two abandoned sand and gravel bunkers, now in ruins, are situated about 1.5 and 2.5 miles, respectively, southwestward of Robinson Point.

Des Moines is a town about 4 miles southeastward of Point Pully. It has bus connections with Seattle and Tacoma. The landing wharf is in ruins. There is a submarine cable crossing to Robinson Point. The town of **Zenith** adjoins Desmoines on the south. The Masonic Home and water tank in Zenith are prominent landmarks.

Redondo, on **Poverty Bay,** about 6.8 miles southeastward of Pully Point, is a village with a post office. There is no landing wharf, communication being by highway; a short pleasure pier with a small boat landing is located here. There is a wharf with a depth of 20 feet at **Lakota,** 15 miles southward of Redondo. **Dumas Bay,** a cove just to the westward of Lakota, has several small wharves, which bare at low water.

Quartermaster Harbor lies between Maury and Vashon Islands, opposite Commencement Bay. The shores are low and wooded, with numerous clearings, and at the head of the harbor is a narrow isthmus connecting Vashon and Maury Islands, which almost covers at extreme high tide. The harbor is irregular in shape, with a total length of about 5 miles and an average width of 0.5 mile. If affords excellent anchorage about 2 miles inside the entrance in 5 to 10 fathoms, muddy bottom. The harbor is easy of access, and a midchannel course may be followed with safety.

.A shoal just inside the entrance, between **Neill Point** and **Point Piner,** extends 300 yards from the eastern shore and is marked at its outer end by a buoy. Just northward of Neill Point and also for 1 mile along the western shore opposite **Manzanita,** shoal spots extend 400 yards off-shore, with depths of 2¼ to 2¾ fathoms. Depths of 4¼ fathoms lie near midchannel westward of Manzanita, and also near midchannel westward of Dockton.

There are many settlements along the shores of the harbor, all having landing wharves, where steamers from Tacoma call daily. Under the high bluffs on the western side, from Neill Point northward are the following summer resorts: **Harbor Heights, Indian Point, Magnolia Beach,** and **Shawnee,** and on the eastern side are **Rosehilla** and Manzanita. The harbor is visited by large numbers of yachts and pleasure craft.

Burton is a town on the peninsular projecting eastward from the western side about 3 miles from the entrance. A landing wharf, 760 feet long, is built out southward from the narrow part of the peninsula to 12 feet at low tide. There is a hotel at Burton. Vashon College has been abandoned.

*Lat. 47°23′.3, Long. 122°22′.4: Chart 6460.

Dockton, in the bight on the eastern side about 2.5 miles from the entrance, is commercially the most important community in the harbor. There are a small clam factory, a boat yard engaged in building fishing boats, and two landing wharves. There are a number of log rafts and booming grounds northeastward of Dockton.

Newport, with a float-landing in 6 feet of water, is on the western shore just northward of the Burton Peninsula.

Quartermaster is a town site on the northern shore at the head of the harbor. There are a few houses on it and a landing wharf built out to 8 feet of water.

In the upper part of the harbor, northward of the Burton Peninsula, are located several private wharves and floats.

COLVOS PASSAGE

(CHART 6460)

Colvos Passage, on the western side of Vashon Island, is about 11 miles in length in a general southerly direction, with an average width of 1 mile. The passage is nearly straight and free of dangers. The northern entrance is about 4.5 miles southward of Alki Point, and the southern entrance is about 4 miles westward of Point Brown and abreast Point Defiance. The passage is used principally by local passenger steamers, and by tugs from upsound points with logs for the sawmills. A midchannel course can be followed with safety.

The currents in Colvos Passage, especially the ebb, have greater velocity than in the East Passage, and advantage is taken of this, at times, by vessels bound from Tacoma to Seattle, South, although the distance is slightly greater.

In the passage between Blake Island and Point Southworth, the current is weak and irregular. At Point Defiance, the current attains estimated velocities up to 4 knots on the flood and 6 knots on the ebb.

The current in **Dalco Passage,** southward of Colvos Passage, is said to run westward on the flood, and it is reported that eastward of Point Defiance and along the south shore of Commencement Bay, the current runs continuously westward.

Point Southworth*, on the western side of the northern entrance, is high and wooded.

There are several landings on the western shore of Colvos Passage with landing wharves suitable for the local sound steamers, the principal ones being **Fragaria, Olalla,** and **Maplewood.** A rock baring at half tide is reported 400 yards northward of the wharf at Olalla. There is extensive logging at Olalla.

Cove, Lisabeula, Camp Sealth, and **Spring Beach** are villages with post offices, and **Biloxi, Sylvan, Colvos,** and **Cross Landing** are settlements on the eastern shore. **Tahlequah** is a resort on the southern shore between Neill Point and **Point Dalco.** All have landing wharves. Gasoline and oil are available on the wharf at Cove, which is built out to 9 feet and is 60 feet long; supplies are available at the store in the village.

Gig Harbor is an inlet about 1 mile long and 0.2 mile wide, on the west side of the southern entrance to Colvos Passage abreast Point Defiance. **Gig Harbor Light** is shown from a white wooden house, on the southern end of the sand spit at the eastern side of the entrance. A low sand spit, 220 yards long, projects southwestward from the eastern point, contracting the entrance to less than 100 yards in width, with a narrow 10-foot channel in the middle; the currents in this channel have considerable velocity. Inside the entrance the basin has from 4 to 6 fathoms in it. The surrounding land, partially cleared of timber, slopes gently toward the shores, and is thickly settled.

*Lat. 47°30′.6, Long. 122°29′.6: Chart 6460.

The town of **Gig Harbor** extends along the western shore and the head of the harbor. It serves an extensive agricultural district and is the home port of many fishing boats. The town has a small sawmill and three boat yards, one of which has a small concrete graving dock 171 feet long which will accommodate vessels of 9-foot draft. There are several landing wharves in the harbor, including two at which fuel oils and fresh water may be obtained.

Communication is had with Tacoma by telephone and by steamers and ferry making several trips daily. Mail is distributed by bus from Gig Harbor to points on Wollochet Bay, Hale Passage, Carr Inlet, and the surrounding country. Bus connections are made with Port Orchard and Bremerton.

Directions.—On entering, hold midway between the spit (on the eastern side) and the western shore until just inside the entrance. Then swing right toward the eastern shore until past the short spit extending from the western shore, and steer a midchannel course into the harbor.

COMMENCEMENT BAY (TACOMA HARBOR)

(CHART 6407)

Commencement Bay has its entrance about 18 miles southward of Alki Point and 56 miles from Point Wilson. The bay is about 2.5 miles in length and has an average width of nearly 2 miles. The waters are deep throughout, ranging in depth from 570 feet at the entrance to 100 feet at the head, where they shoal abruptly to mud flats, bare at low water. The bay is easy of access and free of dangers.

Tacoma, the second city in size and importance on the sound, is situated on the southern and southwestern shores of Commencement Bay. It has an extensive commerce, both foreign and domestic, exporting large amounts of flour, cotton, wheat, machinery, lumber, and general merchandise; it also has part of the Alaska trade.

Point Brown, the northern point at the entrance to Commencement Bay, is marked by a light on a white tower. **Point Brown Light*** is 38 feet above water and visible 11 miles. The fog signal is sounded on an air horn. In the bight, just northward of the point, is **Caledonia,** a small settlement with its landing wharf in ruins. Several houses and a landing wharf are located around the point on the south side.

Dash Point is about 1 mile northward of Point Brown. The town of Dash Point is located on the point, and on its north side is a wharf built out to 20 feet.

Point Defiance, the western entrance point of Commencement Bay, terminates in a very prominent, abrupt dirt bluff, 160 feet high. **Point Defiance Light,** 18 feet above water, is shown from a white house on platform on piles, westward of the point. A fog signal is sounded on an air diaphragm horn. **Point Defiance Park,** covering the area around Point Defiance, is wooded for a mile from the end of the point.

From the flats at the head of Commencement Bay, the city waterfront extends northwestward along the western shore to within 1.5 miles of Point Defiance. Here are numerous industrial plants, with wharves to accommodate deep-draft vessels.

The most prominent of these is a large ore smelter located 2 miles southeastward of Point Defiance. The remarkably **high chimney** is the predominating landmark of the vicinity.

The flats at the head of the bay have been improved by dredging several basins and channels and by the construction of wharves, warehouses, railway terminals, and various industrial plants.

*Lat. 47°18′.4, Long. 122°26′.6: Charts 6407, 6460.

The **City Waterway,** the southernmost of these basins, has project dimensions as follows: 500 feet wide and 29 feet deep from deep water to the South Eleventh Street Bridge; 500 feet wide and 22 feet deep to the South Fourteenth Street Bridge; thence varying from 500 feet to 250 feet wide and 19 feet deep to the head of the waterway, a total length of 8,500 feet.

The controlling depths when last ascertained were as follows: Below South Eleventh Street, 28.7 feet except near the sides, in April 1940; South Eleventh to South Fourteenth Streets, 21.1 feet except near the sides; South Fourteenth Street to the head of the waterway 17.4 feet except near the sides, in January 1941. † In _____ 19___, the contracting depths in the channel were: _____

_____

_____

On the western side of the entrance to City Waterway is a privately maintained light and fog signal (bell) on a pile. At the eastern side of the entrance is the **Tacoma Waterway Light** and fog signal. The light is shown from a white post, at a height of 22 feet above water, and the fog signal (bell) is sounded from a white house on black pile structure.

City Bridge, at South Eleventh Street, has a vertical lift span with a 200-foot horizontal clearance, and a vertical clearance of 135 feet above MHW when lifted. When in place there is a vertical clearance of 60 feet above MHW. The signal for opening is 3 long and 1 short blast of the whistle.

The following special regulations govern the operation of this bridge:

Closed periods.—Between the hours of 6:45 and 7:45 a. m. and 3:45 and 5 p. m. the draw need not be opened: Provided, that during such period the draw shall be promptly opened if necessary to prevent disaster to shipping: And provided further, that it shall also be immediately opened between the hours of 3:45 and 5 p. m. to permit the passage of vessels of 750 gross tons or over.

General Bridge Regulations similar to those in effect for Seattle, see page 330, also govern here.

The Northern Pacific bridge at South Fourteenth Street is a swing bridge and has two openings of 100 feet. There is a clearance of 12.6 feet above high water when the bridge is closed. The signal for opening is 2 long blasts and 1 short blast of the whistle.

The Oregon-Washington Railroad bridge near South Fifteenth Street has two openings of 100 feet, and a clearance of 3 feet above MHW with the bridge closed. The signal for opening is 1 long, 1 short, and 1 long blast of the whistle.

The **Middle Waterway** is the next waterway northeastward of the City Waterway. The outer wharf has been dredged to 32 feet on the east, north, and west sides. In 1936 a controlling depth of 22 feet was available for a distance of 450 yards in Middle Waterway beyond the inner end of the lumber dock. The channel is close along the face of the dock on the eastern side of the waterway, with a width of only 50 yards between the wharf face and a 10-foot spot at the narrowest point in the channel entering this waterway.

Puyallup Waterway, through which the **Puyallup River** discharges, has shoaled to such an extent that it cannot be used for commercial purposes.

A city highway bridge crosses the Puyallup Waterway at South Eleventh Street. It affords a horizontal clearance of 150 feet and a vertical clearance at MHW of 22 feet when closed and 133 feet when opened. The signal for opening is 3 long and 1 short blast of the whistle.

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†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

Just southward of the South Eleventh Street Bridge, the Chicago, Milwaukee, St. Paul & Pacific Railroad crosses the Puyallup Waterway on a swing bridge with 2 openings of 120 feet and a clearance when closed of 4.5 feet. The opening signal is 3 long and 2 short blasts.

Several bridges span the Puyallup River farther up, but this section of the river is used only by small boats with local knowledge.

A shoal area 200 yards northwestward of the end of the jetty on the western side of the Puyallup Waterway has been dredged to a least depth of 30 feet and a 30-foot channel dredged to and alongside the pier adjacent to the west jetty.

Milwaukee Waterway has been dredged to 35 feet. Various commercial interests have leased the wharves in this waterway. A light is shown from a white square house on piles at the southwestern side of the entrance. A fog signal is sounded on an air horn.

Sitcum Waterway, northeastward of Milwaukee Waterway, is shoal and used for log storage.

The **Wapato Waterway** had depths of 30 feet of water alongside the grain wharf and 32 feet in the slip between the two larger piers in 1936. A narrow channel with 15 feet of water is dredged to the upper end of the waterway to serve a large float for small boats, a sawmill, and a boat-building plant. The channel is marked by buoys.

Wapato Waterway Light is shown from a pile dolphin at the southwesterly entrance to the waterway.

Hylebos Waterway through which the **Hylebos Creek** discharges, is the northernmost of the waterways. The project dimensions of this waterway are as follows: 200 feet wide and 30 feet deep from deep water to the bend below Lincoln Avenue; thence, 150 feet wide and 30 feet deep to a turning basin of the same depth at the inner end, 410 feet wide and 900 feet average length. In July 1942, the controlling depths were as follows: Below East Eleventh Street, 30 feet with a 25-foot shoal on the northern side at the bend; Eleventh Street to Lincoln Avenue, 28.5 feet; above Lincoln Avenue, 29 feet. †In _____ 19___, the controlling depths in the channel were: _____ _____

Hylebos Waterway is crossed by the East Eleventh Street Bridge, which is of the double leaf bascule type with an opening 150 feet wide, and a clearance at MHW of 17 feet when closed. The signal for opening is 4 long blasts of the whistle.

Hylebos Waterway Light, 15 feet above water is shown from a white crossarm on a black pile structure located off the edge of the shoal on the north side of the entrance of Hylebos Waterway. **Hylebos Waterway Entrance Light,** 16 feet above water, is shown from a platform on a black pile doplhin, on the south side of the entrance.

Pilots.—Pilotage is compulsory for all vessels except under coasting trade on the west coast of the United States, including Alaska and/or British Columbia. Pilots may be obtained from the Puget Sound Pilots Association, Seattle, on short notice. See page 268.

Towboats.—Towboats are available at Tacoma.

Quarantine.—Vessels subject to quarantine inspection are given this inspection at Port Angeles. If vessels require fumigation after discharging cargo at Tacoma, this service is performed at the port. Advance notice of 24 hours should be given to the quarantine officer at Tacoma or the senior surgeon of the Public Health Service at Seattle.

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

Customs.—Tacoma is a port of entry in charge of a deputy collector. The customhouse is situated in the Federal Building at South Eleventh and C Streets.

Immigration.—The Bureau of Immigration maintains an office in the Federal Building, Tacoma.

Marine Hospital.—The Public Health Service maintains a relief station and a contract hospital at Tacoma.

Anchorage.—The depths as a rule are too great for convenient anchorage, but vessels occasionally anchor under the northern shore about 1 mile eastward of Point Brown. Vessels may anchor in about 60 feet 450 yards north-northwestward of the outer end of Puyallup Waterway west jetty. The city maintains one mooring buoy just eastward of the entrance to the city waterway. It is in charge of the harbor master.

The **Tacoma Yacht Club Basin** is located about 1.8 miles southeastward of Point Defiance, inside a slag breakwater. It is intended to further enclose this basin by extending the breakwater in a southerly direction.

Harbor regulations are enforced by a harbor master with an office in the municipal dock, on the western side of city waterway near Eleventh Street. The following are extracts from the regulations:

In aid of commerce and navigation, anchorage for vessels is authorized in the following-described water: Any part of Commencement Bay outside the outer harbor line, which is not used by vessels arriving at or departing from any dock.

Anchorage at city buoys: No charge is made for use of the city mooring buoy located near the entrance to city waterway.

It shall be unlawful for any vessel in fog, mist, falling snow, or heavy rainstorms, whether by day or night, to travel in excess of 6 nautical miles per hour on any of the waters of Tacoma Harbor. It shall be unlawful for any vessel in clear weather to travel in excess of 8 nautical miles per hour within 500 feet of the outer harbor line on any of such waters.

No master or other person in charge of any vessel or obstruction shall attach the same to any city buoy until he shall have obtained permission so to do from the harbor master: *Provided,* That during the night or in bad weather such vessel or obstruction may be attached to any vacant city buoy, but the master, owner, or person in charge thereof shall notify the harbor master not later than 9 o'clock a. m. of the next legal day of such act, stating the name and character of such vessel or obstruction and the probable length of time it is desired to remain at said buoy.

No ballast, iron, rock, sand, gravel, or earth shall be deposited in Tacoma Harbor except at such places and under such conditions as may be prescribed by the harbor master and after written permit granted by him, or at such places as may be designated by ordinance.

Tides.—The mean range of tide at Tacoma is 8.1. The range between mean lower low water and mean higher high water is 11.8 feet. A range of about 19.5 feet may occur at the time of maximum tides.

The **tidal currents** in the harbor have little velocity.

Wharfage and **Dockage** charges are made.

Wharves sufficient to accommodate the largest vessels are available.

Storage is available for all types of cargo.

Supplies.—Coal, fuel oils, provisions, and ship chandlers' stores can be had in any quantity.

There is a **chart agency** of the U. S. Coast and Geodetic Survey situated here.

There is no free **lighterage** but scows and tugs are available.

Wrecking and **salvage facilities** are available.

Repairs.—Only minor repairs can be made. The nearest large dry dock is at Seattle. There are marine ways for hauling out vessels up to 125 feet in length. There are extensive ship-building plants.

Communication.—Tacoma is served by 4 important railroads, by 3 commercial air

lines, and by bus lines to all parts of the country. Many foreign and coastwise vessels call. Small freight and passenger vessels serve Puget Sound towns. There are complete telegraph and telephone facilities.

The **United States Coast Guard** Office is located at the Municipal Dock.

The **harbor masters** office is at the Municipal Dock.

Port Series No. 27 covers the port of Tacoma.

Storm warnings are displayed from the roof of the Fidelity Building in Tacoma.

COMMENCEMENT BAY TO BUDD INLET

(CHART 6460)

Southward of Point Defiance,* described on page 355, the sound is composed of a number of inlets, passages, and islands, rising in commercial importance, outside of the lumbering interests, by reason of numerous settlers and agricultural communities which which have been established along the shores. The local water traffic, however, has declined, due to the extensive network of roads which has been contructed in recent years. At many of the villages, the landing wharves have fallen into ruins, all transportation following the highways. A few small freight vessels, however, make regular runs between Olympia or Tacoma and some of the settlements. These waters are also navigated by tugs engaged in towing log rafts to the sawmills, and by pleasure craft. Ocean vessels call at Olympia, principally to load lumber and forest products. The depths are generally great and there are but few dangers. The shores are well wooded and moderately low. The beaches are sand and gravel, with boulders in places, and are often backed by steep, bare sand and gravel bluffs. Olympia, the State capital, at the head of Budd Inlet, is the only city, but there are a number of smaller settlements. The chart is a sufficient guide for safe navigation in daytime. Strangers, bound through these waters at night, are advised to take a pilot.

From Point Defiance, the sound extends in a general southerly direction for about 15 miles to the flats at the mouth of the Nisqually River. The narrow passage southward of Point Defiance is known as **The Narrows;** it is about 5 miles long and 0.8 mile wide and clear of dangers. At times of tropic tides, the currents reach a velocity of 6 knots or more. It is reported that, in navigating The Narrows, the greatest advantage from the current can be gained by favoring the eastern shore.

From Point Defiance the eastern shore of the Narrows consists of high, bold bluffs, until near Days Island Anchorage. A railway, emerging from a tunnel about 1.8 miles southeastward of Point Defiance, follows the beach to the Nisqually River.

From Point Defiance to the head of the sound, the western shore is broken by a number of inlets and passages which afford communication to small settlements devoted to lumbering or agriculture.

Point Evans, 2 miles southward of Point Defiance, is marked by a light on a white skelton tower. The light is 39 feet above the water.

The Narrows are crossed by a power line, with an overhead clearance of about 200 feet, at a point about 200 yards southwestward of Point Evans.

Days Island Anchorage is situated about 4.5 miles southward of Point Defiance. **Sixth Avenue Ferry Landing** locally called **Titlows Wharf** is a small town along the railroad just eastward of Days Island. There are two ferry slips and a wharf built out to 10 feet. A large lumber mill, in poor repair, is located between the ferry docks and

*Lat. 47°19′.0, Long. 122°32′.8: Chart 6460.

the bridge to **Days Island.** The high mill stack is a prominent landmark. There is a 2¾-fathom shoal 230 yards westward of the ferry docks.

A small boat channel, 1 foot deep, leads into **Days Island Lagoon.** The channel favors the Days Island side and under the bridge it is 30 yards from the island shore. It is of little value to strangers, being used only by local boats. Local boats anchor in 3 feet in the lagoon. There is a small boat mooring and service station adjacent to the ferry docks. Anchorage for small boats may be obtained eastward of the northern end of Days Island and southward of the ferry lane.

Automobile ferry service is maintained from Days Island to Cromwell, Point Fosdick and Fox Island. A small passenger and freight vessel calling here maintains service between Tacoma, Carr Inlet, and Hale Passage.

Hale Passage entering on the western shore opposite Days Island is described on page 365.

Gibson Point, the southern extremity of Fox Island and the northern entrance point to the Carr Inlet, described on page 366, is marked by a light. **Gibson Point Light** is shown from a white house. The light is 20 feet above water, and is visible from 222° to 55°.

Toliva Shoal lies nearly in mid-channel, about 8 miles southward from Point Defiance. It consists of two rocks with 1¾ fathoms over them, and is marked by a lighted bell buoy. The shoal may be passed on either side, giving the buoy a berth of 300 yards.

Three miles southward of Days Island anchorage, the shores consist of bright bare bluffs, which are prominent from southward. A bunker for loading sand and gravel is located here just southward of some old pilings which mark the sites of former sand and gravel bunkers.

Balch Passage, between **McNeil** and **Anderson Islands,** is the channel most generally used by vessels bound to Olympia. It is 2 miles long, with an average width of 0.6 mile, and connects at its western end with Drayton Passage.

The Federal penitentiary, on the southeastern side of McNeil Island about 0.8 mile southwestward of **Hyde Point,** is prominent when approaching. It has a wharf, built out to 16 feet at mean lower low water, which is lighted by a row of lights. Fresh water is piped to the end of the wharf. **Bee** is an automobile ferry landing on the south side of McNeil Island, 1 mile westward of the penitentiary. The ferry connects with Steilacoom, Anderson Island landing, and Longbranch.

Eagle Island, small, low, and wooded, lies near the middle of Balch Passage, 0.2 mile from Anderson Island, and is marked on its northern end by a light **Eagle Island Light** is shown from a white house; the light is 21 feet above water, and visible 6 miles. On the shore of Anderson Island southward of Eagle Island is a small private landing. Just westward of this wharf is **Yoman** post office, with a float landing.

Eagle Island Reef, 300 yards westward of Eagle Island, bares 1 foot at its southern part and has a depth of ½ fathom at its northern part. A buoy is moored off the northern extremity of the reef.

Drayton Passage, westward of Anderson Island, is about 3 miles long in a northerly direction and about 1 mile wide; it connects with Pitt Passage described on page 366, and Balch Passage, at its northern end, and at its southern end it connects with the western part of Nisqually Reach, described on page 361. With the exception of a spit extending 0.2 mile from the western shore about 1 mile northward of the southern entrance and marked by a light, the waters are deep and free of dangers. **Drayton**

Passage Light is shown from a platform on a black pile dolphin. The light is 15 feet above water, and visible 5 miles. Estimated current velocities of 1 to 2 knots occur at the southwestern end of the passage.

Filucy Bay, on the western shore opposite Balch Passage, is about 1.5 miles long and irregular in shape; its widest part, 0.4 mile, is at the entrance. **McDermott Point,** the spit at the southern side of the entrance, is marked by a conspicuous tower. Good anchorage in 7 to 8 fathoms, muddy bottom, is afforded 0.2 mile inside the entrance. There are numerous houses around the shores of this bay, and **Longbranch,** with a wharf built out to 9 feet, is in the small cove 0.6 mile from and opposite the entrance. An automobile ferry connects with Anderson Island Landing, Bee, and Steilacoom and a small freight vessel calls here.

Amsterdam Bay, on the eastern shore of Drayton Passage, about 0.8 mile northward of **Treble Point,** the southwestern extremity of Anderson Island, is a small and shallow cove. There is 1 foot in the entrance and about 2 to 3 feet inside the bay. The channel into the bay is close to the northern shore.

Steilacoom is situated on the mainland about 9 miles southward of Point Defiance. The town is of little commercial importance; a limited amount of provisions can be obtained. It has rail and telegraph facilities and a wharf, from which a ferry service is maintained to points on McNeil and Anderson Islands. The State asylum for the insane is situated near here. Indifferent anchorage may be had along the water front close inshore, but it is not recommended, as the holding ground is poor and the currents have considerable velocity. Off Steilacoom, there are tide rips that, with an adverse wind, are dangerous to small boats.

Ketron Island, about 1 mile long, narrow, and about 290 feet high, lies in the southern part of the channel, 10 miles southward of Point Defiance and eastward of Anderson Island. The island is wooded, and the shores are bluff except at the northern end. **Cormorant Passage,** 0.5 mile wide, separates the island from the mainland southward. The passage is clear, but is little used.

Nisqually Reach trends southward and westward around Anderson Island. The southern shore is formed by the Nisqually River flats which at low water are bare for nearly a mile offshore. The edge of the flats is bold with deep water close-to. The reach may be considered to extend from Ketron Island to the southern end of Drayton Passage, about 6 miles, the narrowest part, 0.8 mile wide, being off the southern extremity of Anderson Island. The edge of the flats is marked by a buoy southward of the end of Anderson Island.

Oro Bay, in the southeastern part of Anderson Island, is an irregular bight between **Cole** and **Lyle Points***, the greater part of which is shallow; it affords an indifferent anchorage in about 10 fathoms, but is affected by the currents and affords no protection in northerly weather. A small shallow arm extends about 1 mile northwestward on the western side of the bay. A wharf built out to 7 feet on the western side of this arm serves **Vega,** a small village with a post office. An anchorage for small vessels is available about 200 yards eastward of the wharf at Vega. A long submerged spit extends from the southern entrance point of the arm almost to the small bight on the opposite shore. Care should be taken to clear this shoal in entering.

A wharf of the Dupont powder works, built out from the mouth of **Sequalitchew Creek,** 13 miles southward of Point Defiance, has 23 feet of water. The plant of the powder works is situated a short distance inland and cannot be seen from passing vessels.

*Lat. 47°07′.5, Long. 122°42′.0: Chart 6460.

Nisqually Flats, bare at low tide, begin just westward of the powder wharf and extend west-southwestward for about 3 miles, the western edge being about 0.4 mile westward of **Nisqually Head.** The edge of the flats is steep-to. The wharf of the Giant Powder Works, about 1.5 miles northwestward of Nisqually Head, has a depth alongside of 24 feet. There is a depth of 20 feet on the shoreward side of the slough channel about 70 yards 0° from the wharf.

From Nisqually Reach the sound extends northwestward for about 3 miles, where it branches into a number of inlets, which are described under separate headings following.

Devils Head, the western point at the southern entrance to Drayton Passage, is 280 feet high and heavily wooded. From this point, the shore, broken by two small shallow bights of no importance, extends northwestward for about 5 miles and then trends northward, forming the eastern shore of Case Inlet, described on page 367.

Johnson Point, 90 feet high, marks the western end of the main body of Puget Sound. A light on a small white structure is situated on the sand spit at the extremity of the point. **Johnson Point Light** is 25 feet above water, and visible 6 miles.

Henderson Inlet, locally known as **South Bay,** immediately westward of Johnson Point, extends about 4.5 miles in a southerly direction; the southern part is an extensive flat. The average width of the inlet is about 0.5 mile, and good anchorage is afforded inside the entrance in 5 to 6 fathoms, muddy bottom. A spit makes out about 0.2 mile northward from the western point at the entrance; on the western shore, 0.8 mile southward of the entrance point, there projects a long sand spit. The low shores are timbered, but there are some clearings. On the western shore about 2 miles southward of the entrance is a railroad log dump with booming grounds. There are oyster beds in the southern part of the bay.

Itsami Ledge, with 1 fathom over it, lies 1 mile 250° from Johnson Point Light, and 0.5 mile northward of the western point at the entrance to Henderson Inlet. It is surrounded by kelp and marked by a light. **Itsami Ledge Light,** shown from a small white house on black pile structure, is 20 feet above water. This is a danger in entering Henderson Inlet or Dana Passage, and vessels should pass northward of the light.

DIRECTIONS, POINT DEFIANCE TO BUDD INLET

From Tacoma to Point Defiance, vessels usually give the shore a berth of 0.2 to 0.5 mile, and if meeting the ebb current from the narrows, round Point Defiance close aboard; or if going with the flood, stand out and take a mid-channel course. From Robinson Point vessels steer about **232°,** giving Point Piner and Neill Point a berth of about 0.3 mile, and then head for Point Defiance. Vessels from northward, through Colvos Passage, can hold a mid-channel course.

From Point Defiance, vessels can hold a midchannel course for 7.8 miles until up with Toliva Shoal, which may be passed on either side, giving the buoy a berth of over 300 yards. Then steer about **249°** from Toliva Shoal buoy and follow the southern shore of McNeil Island at a distance of 0.25 mile; Eagle Island may be passed on either side. The passage northward of Eagle Island is the wider, and a midchannel course through it should be held until well past Eagle Island Reef Buoy and until Drayton Passage is well open. A midchannel course through Drayton Passage clears all dangers. Round Devils Head at a distance of 0.3 mile and steer **305°,** to pass 0.3 mile northward of Johnson Point Light.

Or, if bound through Nisqually Reach, a general midchannel course should be steered from Toliva Shoal buoy, rounding Lyle Point, the southern end of Anderson

Island, at a distance of 0.4 mile, passing halfway between the point and Nisqually Flats buoy, and then steering a general midchannel course until up with Johnson Point.

Round Johnson Point at a distance of 0.3 mile and pass northward and westward of Itsami Ledge Light; keep in mid-channel through Dana Passage, giving the southern shore a berth of not less than 0.2 mile until up with the Dofflemyer Point, then follow the directions for Budd Inlet, page 364.

BUDD INLET (OLYMPIA HARBOR)

(CHART 6462)

Dana Passage, between **Brisco Point,** the southern extremity of Hartstene Island, marked by a light, and the mainland, is about 2 miles long and nearly 0.5 mile wide in its narrowest part. **Brisco Point Light,** shown from a white house, is 38 feet above water, and visible 5 miles. Dana Passage connects at its western end with Budd and Eld Inlets, and northward with Peale and Squaxin Passages leading to Totten and Hammersley Inlets and Pickering Passage. With the exception of Itsami Ledge, near its eastern end, the passage is clear and a midchannel course may be followed with safety. The strength of the current in Dana Passage has an estimated velocity of 2 to 3 knots, and heavy tide rips may be encountered during strong southerly and westerly winds.

Budd Inlet is 26 miles from Tacoma. It is about 6 miles in length, with an average width of 1 mile, extending southward from Dana Passage and terminating in flats bare at low water. The entrance is 4.5 miles southwestward from Johnson Point Light, between **Cooper Point*** and **Dofflemyer Point,** the latter being marked by a light shown from a white pyramidal tower. **Dofflemyer Point Light** is 30 feet above the water. A fog signal is sounded on an air horn. The depths in the entrance to Budd Inlet range from 27 to 36 feet. Good anchorage may be had anywhere inside the entrance in muddy bottom. The shores are comparatively low and wooded, and the depths shoal less abruptly on the eastern than on the western side of the inlet. The southern half of the bay is obstructed by flats and shoals that bare at low water for 0.8 mile, through which channels have been dredged to the Olympia water front. A shoal, with 5 to 15 feet over it, extends 700 yards from the eastern shore between Olympia Shoal and the entrance to the dredged channel.

Olympia Shoal lies about 0.4 mile off the western shore and 0.8 mile northward of **Butler Cove,** which is a small bight on the western shore about 4 miles northward of Cooper Point. It bares, and is marked on its eastern side by a light. **Olympia Shoal Light** is shown from a white house on a pile dolphin. The light is 22 feet above water, and visible 10 miles. A fog signal is sounded on an air diaphragm horn. The channel to the westward of Olympia Shoal is marked by a light on either side. The lights are shown from pile dolphins.

Landmark.—The capitol dome is the most prominent object in this vicinity. It is conspicuous from the entrance of Budd Inlet.

Olympia Harbor has been improved by the Government by dredging. The project provides for a channel 300 feet wide and 30 feet deep, from deep water through the flats at the head of the inlet to Olympia, with a turning basin 800 feet by 2,000 feet off the city water front. In September 1942, the controlling depth was 29 feet in the channel and 30 feet in the turning basin except for a 27-foot shoal in the eastern half of the

*Lat. 47°08′.9, Long. 122°55′.5: Charts 6462, 6460.

channel 530 yards southward of Olympia Harbor Range Front Light. †In _____ 19____, the controlling depths in the channel were:_____

_____.

A second (west) channel 12 feet deep and 200 feet wide has been dredged along the western shore, but it has not been maintained since the eastern channel has been deepened.

The eastern or main channel is marked by lights, buoys, and ranges.

Pilots and quarantine.—The same procedure applies as at Tacoma.

Towboats.—Two towing companies maintain headquarters at Olympia. The tugs are small, the maximum having 180 horsepower.

Customs.—A deputy collector of customs maintains an office at the port terminal. There are neither customs nor bonded warehouses in Olympia.

Marine hospital.—The Public Health Service maintains a medical relief station and a contract hospital at Olympia.

Directions.—No detailed directions are necessary. A mid-channel course through Budd Inlet clears all dangers until approaching Olympia Shoals. Then change course so as to pass between the lights marking the channel to the westward of Olympia Shoal. When off Butler Cove, pick up the range ahead **144°** and follow it through the dredged channel. At the turn in the channel pick up the range astern, **353°**, and follow it to the wharves.

Tides.—The mean range of the tide at Olympia is 10.5 feet while the range between mean lower low water and mean higher high water is 14.4 feet.

Olympia, the capital of the state of Washington, is situated at the head of Budd Inlet. It is rapidly growing in importance as an overseas port. Lumber and logs comprise over 90 percent of the water-borne traffic of the port. The eastern side and end of the main dredged channel is the only part of Olympia Harbor with wharves open to public use. The port terminal is the principal wharf; it is 2,000 feet long, with berthing space for its full length and a depth of 37 feet alongside. The industrial plants, chiefly lumber mills, are located in the shallower portions of the harbor along the western and southeastern shores and these move their products either by lighters to vessels, or move them by trucks or cars to the port terminal. The oil wharf northward of the port terminal has a depth of 32 feet at its face. The oil wharf westward of the yacht club had a depth of 19 feet at its face. A number of landing floats for yachts are maintained just westward of the end of the main channel.

Supplies.—Water, provisions, and a moderate amount of ship chandler's stores can be obtained. Diesel oil and gasoline are available at two oil wharves.

There is a **chart agency** of the U. S. Coast and Geodetic Survey situated here.

Repairs.—There is a marine way and a gridiron large enough to take care of the small local boats. Emergency repairs can be handled by local machine shops, a welding works, and a boiler works.

Port Series No. 23. covers the port of Olympia.

Communication.—Olympia is served by two transcontinental railways and several foreign and domestic steamship lines have regular schedules here. There are complete telephone and telegraph facilities.

Airport.—The municipal airport is located 4.5 miles southward of the city. No charge is made for landing or for use of the temporary sheds on the ground.

†Date and values to be inserted by the navigator from data in the latest Supplement or Notice to Mariners.

Deschutes Waterway at the head of Budd Inlet, goes dry at low water except for a small stream coming from the **Deschutes River**. Tugs follow the stream to **Tumwater** at half tide using various piles as aids. Three bridges cross the waterway between Olympia Harbor and Tumwater. The Fourth Street Bridge at Olympia, is a fixed span with a horizontal clearance of 68 feet and a vertical clearance of 13.5 feet at MHW. The Northern Pacific Railroad bridge at **Capitol Point**, 0.4 mile southward of Fourth Avenue, is a lift bridge with a horizontal clearance of 57 feet and vertical clearance above MHW of 17 feet when open and 2 feet when closed. The Tumwater Bridge has 2 fixed spans with horizontal clearances of 20 feet and a vertical clearance of 17.9 feet at MLLW. The ruins of a bridge remains just northward of Tumwater.

Eld Inlet, locally known as **Mud Bay,** immediately westward of Budd Inlet, is of little commercial importance. It is somewhat narrower than Budd Inlet, and extends about 6 miles in a general southwesterly direction with two slight bends. It affords good anchorage anywhere inside the entrance in 24 to 42 feet soft bottom. A mid-channel course is clear to the flats at its head. In entering, Cooper Point, the eastern point at the entrance, should be given a berth of not less than 0.2 mile. Logs are towed from here to Olympia, Tacoma, or Seattle. Extensive oyster beds are cultivated near the head of the bay.

INLETS AND PASSAGES WEST OF THE MAIN CHANNEL

(CHART 6460)

HALE PASSAGE

(CHART 6460)

Hale Passage, between **Fox Island** and the mainland, enters on the western shore about 5 miles southward of Point Defiance. It is about 4 miles in length and varies in width from 1 mile at its eastern end to less than 0.4 mile at its western end, where it connects with Carr Inlet. A shoal is situated about 0.8 mile eastward of the northern end of Fox Island and near the middle of the passage; it is boulder-strewn and bares at low water. A 1-fathom, kelp-marked shoal is 200 yards eastward of Grave Island. A good, small boat anchorage is available on either side of Grave Island. The tidal currents have considerable velocity. It is reported that the current runs eastward into Hale passage at all times.

Sylvan, a village with a post office is situated on the south side of Hale Passage, on the eastern side of the bight in Fox Island southward of **Grave Island**; it has a landing wharf in 9 feet of water. A church, schoolhouse, and store are located here, and the village has telephone connection with Tacoma.

There are fruit farms along the north shore of Hale Passage, also on Fox Island. **Warren** is a small village on the northern shore of Hale Passage abreast the northwestern end of Fox Island; it has a landing wharf. **Arletta**, also on the northern shore, in the bight abreast the western end of Hale Passage, has a wharf built out to 8 feet. There are other villages and landings of lesser importance on this shore, including **Sunny Bay, Cromwell**, and **East Cromwell**.

Wollochet Bay is a small inlet, about 2 miles long and 0.2 mile wide, extending northward from Hale Passage about 1 mile inside the eastern entrance. The upper part of the bay is narrow and shoal. It affords an anchorage about 0.3 mile inside the entrance, in mid-channel, in 11 to 12 fathoms, sticky bottom. A small private

pier is situated about 0.5 mile from the head of the bay. **Wollochet**, with 12 feet at the wharf, is located on the eastern point at the entrance, and there are farmhouses on both sides of the bay. A small sawmill is located at Wollochet. An area at the head of the bay is planted with oysters.

CARR INLET

(CHART 6460)

Carr Inlet enters the western shore of the sound about 8 miles southward of Point Defiance. From the entrance, between Fox and McNeil Islands, it extends about 6 miles west-northwestward and then trends northward for 8 miles, terminating in flats at the head. Good anchorage is afforded at and near the head in 6 to 15 fathoms, soft bottom, and in several small coves on its southern and eastern shores. From the entrance, a mid-channel course may be followed with safety.

Gertrude, a village with a post office, is situated on the southern side of Carr Inlet, on the shore of **Still Harbor**, which is a bight on the northern side of McNeil Island, southward of **Gertrude Island**. It has a landing in 10 feet of water. The bottom in the middle of Still Harbor is uniform, with depths of 8 to 9 fathoms, sand and mud bottom. The bottom slopes gradually to a flat of sand and gravel at the head of the bay, eastward of the wharf at Gertrude.

Wyckoff Shoal, partly bare at low tide, extends 0.8 mile westward from the northwestern part of McNeil Island. A winding channel of 2 fathoms, between Wyckoff Shoal and McNeil Island, is used with local knowledge.

Pitt Passage, westward of McNeil Island, connects Drayton Passage, described on page 360, and Carr Inlet. It is obstructed about midway of its length by **Pitt Island** and its surrounding rocks and shoals, and is used only by small craft with local knowledge, which use the passage east of Pitt Island. It is reported that in Pitt Passage the current sets northward at all times with an estimated velocity near Pitt Island of 2 to 3 knots. There is an overhead cable crossing just southward of Pitt Island, with sufficient clearance for the small vessels which use the passage. **Meridian**, a small village with a post office and a wharf built out to 4 feet, is situated on the eastern shore of Pitt Passage, about 0.4 mile inside the southern entrance.

Delano Beach is a summer resort on the southern shore of Carr Inlet, in the bight westward of **South Head**. It has a landing wharf which has 4 feet of water. The bight is shallow, a large part of it baring at low tide.

Lakebay in **Mayo Cove** on the southwestern shore of Carr Inlet, is a village with a post office and a landing wharf 350 feet long, with 6 feet at its face. The cove is shoal except in the middle near the entrance. The channel to the wharf is difficult to navigate and strangers are advised to proceed cautiously or to obtain local advice.

Home is a farming village on the western side of **Von Geldern Cove**, which is locally known as **"Joes Bay."** There are extensive log dumps and booming areas in Von Geldern Cove. The wharf is reported to have 6 feet of water alongside. The outer edge of the sand spit extending out from the eastern shore of the cove is only about 75 yards distant from the wharf. A farming colony occupies the shores of the cove.

Glencove is a small settlement in **Glen Cove** on the western side of Carr Inlet, about 5 miles north-northwestward of South Head. There are extensive log dumps and booming areas in Glen Cove. A road leads across to Vaughn Bay on Case Inlet.

Elgin is a village with a post office on **Huge Creek** on the western side of Carr

Inlet. The entrance to the creek is bare at low water. A number of old wooden ships have been beached and partially burned on the western shore of Carr Inlet near Huge Creek. Considerable quantities of logs are towed from the creek.

Wauna is a village with a post office at the head of Carr Inlet, where the spit, inclosing **Burley Lagoon,** joins the mainland. A county road leads hence along the spit and across the entrance to the lagoon over a fixed bridge to Rosedale and Gig Harbor. The bridge has a vertical clearance of 18 feet at MHW. The landing wharf dries at low water. **Burley** is a village at the head of Burley Lagoon. **Purdy** is situated on the eastern shore at the head of Carr Inlet.

Rosedale is a farming village on the cove on the eastern side of Carr Inlet, eastward of **Raft Island,** which is 180 feet high. The landing wharf is in ruins. There is an extensive shoal area around and between Raft and **Cutts Islands.** The shores of these islands are strewn with boulders.

Horsehead Bay, about 1 mile in length and 0.1 mile in width, in a southerly direction, is located directly northward of **Green Point,** at the western extremity of Hale Passage. A small wharf, near the eastern entrance of the bay, can accommodate fair size craft, and on the northern side is a float for small boats.

CASE INLET (NORTH BAY)

(CHART 6460)

Case Inlet extends northwestward for about 4 miles and then trends northward for 10 miles more, terminating in flats at the head, which is but 2 miles from the head of Hood Canal. Its average width is 1.5 miles, narrowing at the head. The depths are irregular, varying from 10 to 30 fathoms, but there are no outlying dangers. The western shore southward of Pickering Passage, is formed by **Hartstene Island. Herron Island**, steep and bluff on its western face, lies near the eastern shore about 4 miles from the entrance. A bar extends across the northern end of the passage between Herron Island and the eastern shore of the inlet. A depth of 21 feet can be carried over the bar by rounding the northeastern tip of Herron Island at a distance of 300 to 500 yards. A low-water spit extends 200 yards off the northeastern tip of the island. At the northern end of Hartstene Island is the entrance to Pickering Passage. Good anchorage may be had anywhere northward of Hartstene Island, in 6 to 15 fathoms, muddy bottom, and a mid-channel course through the inlet is clear of all dangers.

There are numerous farms and several small settlements, whose chief industries are oyster culture, farming, and some logging. The flats near the head of the inlet are largely covered with oyster beds. Communication is had by highway and small freight vessels.

Ballow is a small village with float-landing situated on the western shore of the inlet, about 2.2 miles northwestward of **Wilson Point** which lies on the western side at the southern entrance to the inlet. **McMicken Island** lies 0.5 mile northward of the village and is connected with the shore by a flat, bare at low tide.

Herron, with wharf built out to 2 feet, is a small village on the eastern shore, about 0.5 mile northward of Herron Island.

Pickering Passage indents the western shore of Case Inlet, about 2 miles northwestward of Herron Island. The passage extends in a general southerly direction for 8 miles, connecting at its southern end with Peale Passage and Totten Inlet. The width varies from 0.2 to 0.5 mile, the shores are generally low and wooded, and the

depths vary from about 6 to 15 fathoms. Except for the shoals extending eastward from the mouth of Hammersley Inlet, the passage is free from outlying dangers, and a mid-channel course can be followed with safety. It is reported that the flood current enters both ends of the passage and that velocities of 1 to 2 knots occur near the southern end. Numerous small farming settlements, generally consisting of 2 or 3 houses and a float landing or small wharf, are located along the shores of the passage. The settlements are served by small local vessels. A small automobile ferry crosses the inlet about 3.5 miles northward of Hammersley Inlet.

Dutchers Cove is a small bay on the eastern side of Case Inlet, about 2.5 miles northward of Herron Island.

Stretch Island lies near the western shore of Case Inlet, just northward of the entrance to Pickering Passage. There is no through channel westward of this island. The northern part of the island is partly cleared of trees and laid out in orchards. Two small grapejuice factories are located on the island. There is a private landing wharf built out to 12 feet on the northern end of the island. A highway bridge connects with the mainland.

Grapeview is a village with a post office on the northern shore of Stretch Island. It has a wharf obstructed by rocks which have been dumped along its face; the wharf bares at low water.

Detroit is a village on the mainland opposite Grapeview. It has a wharf with a depth of 6 feet.

Reach Island, locally known as **"Oak Island,"** lying 0.2 mile northward of Stretch Island, is separated from the western shore by a shallow channel, locally known as **"Fair Harbor."** A rock, baring 5 feet, is near the middle of the passage back of Reach Island. The through channel is westward of the rock and has a controlling depth of 1 foot. To avoid the rock when it is covered, favor the western shore.

Vaughn, a village with a post office and a county wharf with 2 feet of water, is situated on the northern shore of **Vaughn Bay,** which lies on the eastern shore of the inlet, about 4 miles from the head. A channel, 2 feet deep, leads to the deeper water in the bay. Follow the northern shore for 200 yards after entering in mid-channel off the end of the spit; then cross the bay parallel to the spit at a distance of 200 yards, heading toward the southern shore, and then follow the southern shore at a distance of 200 yards, steering toward the head of the bay. Around the shores are numerous farmhouses and orchards. A county road leads hence to Glencove on Carr Inlet, and connects with points to the northward and southward. A small sawmill is situated at the head of the bay. There are extensive log-booming areas at Vaughn.

Rocky Bay is the shallow bay northward of Vaughn Bay. A float landing in 10 feet of water is established northward of the point dividing the two bays and is used at low tide when Vaughn Bay cannot be entered. A channel 3 feet deep leads to the lagoon back of the sand spit near **Windy Bluff,** the point between Vaughn and Rocky Bays. It is necessary to come around the small sand island northward of the spit. Oysters beds are planted on the eastern side of the bay northward of the spit.

Eberhardt Cove is the local name of the small cove on the western side of Case Inlet about 0.7 mile northward of Reach Island.

Allyn is a village with a post office on the western side of Case Inlet, near the head, about 0.5 mile northward of **Sherwood Creek.** A draft of 7 feet can be carried to the wharf at Allyn by following the eastern shore at a distance of 125 to 150 yards when past the oyster beds on the eastern side of the inlet; when abreast of the wharf, cross over to it. Oyster culture and fruit raising are the principal industries.

Victor is a small village near the head of Case Inlet, on the eastern shore. It has a wharf built out to 6 feet, but it is old and seldom used. Logging is carried on in the vicinity.

SOUTHWESTERN INLETS

(CHART 6460)

Peale Passage, about 4 miles long, between Harststene and Squaxin Islands, extends in a general northwesterly direction from Dana Passage, connecting at its northern end with Pickering Passage, described on page 367, and has a controlling depth of about 13 feet in mid-channel. Strangers should not attempt the passage. The current attains an estimated velocity of 3 knots in the narrow portion of the passage. It sets northward on the flood.

Squaxin Passage, southward of **Squaxin** and **Hope Islands,** is about 1 mile in length and extends in a general westerly direction. It leads to the entrance of Totten and Hammersley Inlets. **Hunter Point Light,** shown from a small white house, marks the southwestern entrance point of the passage. The light is 15 feet above water. The northern shore is foul; a shoal with 19 feet over it lies 150 yards off the western shore of Hope Island abreast Steamboat Island. The passage is narrow, and although the chart is a good guide, strangers should proceed with caution. The southern shore should be favored, and at the western end, the northern point of Steamboat Island should be favored to avoid the shoal mentioned above. Currents of 4 knots or more accompanied by strong tide rips are said to occur. The passage between Hope and Squaxin Islands has a least depth of 9 feet in the middle. A reef, bare at extreme low water, southeastward of Hope Island is easily avoided in Squaxin Passage by keeping the northern point of Steamboat Island well open of the southern point of Hope Island.

Steamboat Island is connected with **Carlyon Beach** on the mainland by a bridge. The island is practically a part of the mainland. The northwestern end of the island terminates in a long sand spit. On the eastern side of Carlyon Beach is located a recreation beach. A float with a boat-house at the end extends 100 yards from the shore.

Totten Inlet extends southwestward from the western end of Squaxin Passage. It is about 8 miles long and varies in width from 0.2 to over 1.8 miles. A depth of 30 feet can be carried to a point off the entrance to Skookum Inlet. A 3½-fathom shoal lies about in mid-channel at the entrance, 620 yards 240° from the southern end of Steamboat Island. A spit extends westward for about 100 yards from Steamboat Island. In entering, favor the western shore to avoid the spit and shoal. The inlet shoals gradually to about the longitude of **Burns Point,** 100 feet high, on the southern shore, where it bares at low tide. **Oyster Bay,** southward of Burns Point, is an extensive mud flat; oysters are grown in this area. Southward of the entrance to Skookum Inlet, along the shores of Totten Inlet are rock or concrete walls enclosing the oyster beds. The walls are a danger to navigation and the oyster industry discourages boatmen entering these waters. Local knowledge is required in piloting boats beyond the rounding point on the western shore which is about 3 miles from the head. Good anchorage may be had anywhere inside the entrance to the mouth of Skookum Inlet.

Skookum Inlet is a small, shoal inlet, with a narrow entrance, which indents the western shore of Totten Inlet about 3.5 miles from the entrance. There is a small boat landing with 4 to 6 feet of water in the easterly part of **Wildcat Harbor,** on the south side of Skookum Inlet, just inside the entrance. **Deer Harbor,** on the northern side of

the inlet, opposite Wildcat Harbor, is used for log dumps and booming grounds; there are also extensive booming grounds at the head of the inlet.

Hammersley Inlet indents the western shore of the sound about a mile northward of the western end of Squaxin Passage. It is about 6 miles in length, expanding at its head into **Oakland Bay,** which is 3.5 miles long in a northeasterly direction, and from 0.2 to 0.5 mile wide. The inlet averages 0.2 mile in width and is obstructed by shoals, particularly at its mouth, where there is an extensive bar. The shoals have been partially removed and in 1937, the controlling depth in the inlet was 10 feet. It is navigated only by light-draft vessels, and by tugboats with log rafts; local knowledge is required. The tidal currents have estimated velocities up to 5 knots in the entrances. Vessels enter on the flood, usually after half tide, and leave on the ebb, usually before maximum strength. Hammersley Inlet is considered dangerous for strangers, and they are advised not to enter without a pilot. Vessels with sharp rise of bilge should avoid the inlet, as there is danger of turning over in the strong current in case of grounding.

Arcadia is a small settlement located on the southern point of the entrance to Hammersley Inlet, which is marked by a light. **Arcadia Light,** shown from a white arm on a post, is 12 feet above water, and visible 8 miles.

Libby Point, on the northern side, 2 miles from the entrance is marked by a light shown from a white arm on a post. **Libby Point Light,** opposite the entrance of **Gosnell Creek**, is 15 feet above water.

Church Point, on the northern side of the inlet, about 3.5 miles from the entrance, is marked by a light. **Church Point Light,** shown from a square white house, is 20 feet above water, and visible 8 miles.

Shelton, at the head of the inlet, is a town of some commercial importance. Extensive logging and lumber interests are centered here. It is on a branch of the Northern Pacific Railway, and lumber is shipped by rail only. Railway trestles which are used as log dumps, extend across the flats. There is a wharf on the northern shore with a depth of 9 feet at its face. There are several floats southward of the wharf, for the accommodation of small craft. There is communication with Olympia by light-draft vessels and by rail and bus; there is complete telephone and telegraph service. Launch fuels and some supplies can be obtained. Oysters are cultivated in the shoal portions of Oakland Bay.

Chapter 19.—APPENDIX

COAST AND GEODETIC SURVEY

COAST PILOTS

	Price
U. S. Coast Pilot, Atlantic Coast, Section A, St. Croix River to Cape Cod	$1.00
U. S. Coast Pilot, Atlantic Coast, Section B, Cape Cod to Sandy Hook including Long Island Sound	1.00
U. S. Coast Pilot, Atlantic Coast, Section C, Sandy Hook to Cape Henry including Delaware and Chesapeake Bays	.75*
U. S. Coast Pilot, Atlantic Coast, Section D, Cape Henry to Key West	.75*
U. S. Coast Pilot, Gulf Coast, Key West to the Rio Grande	.75*
U. S. Coast Pilot, West Indies, Puerto Rico, and Virgin Islands	.75
Inside Route Pilot, New York to Key West	.50
U. S. Coast Pilot, Pacific Coast, California, Oregon, and Washington	1.00
U. S. Coast Pilot, Alaska, Part I, from Dixon Entrance to Yakutat Bay	.75*
U. S. Coast Pilot, Alaska, Part II, Yakutat Bay to Arctic Ocean	.75*
U. S. Coast Pilot, Hawaiian Islands	.50
U. S. Coast Pilot, Philippine Islands, Part I, Luzon, Mindoro, and Visayas	1.25
U. S. Coast Pilot, Philippine Islands, Part II, Palawan, Mindanao, and Sulu Archipelago	1.25
Distances Between United States Ports	.10

*The price of these publications will be $1.00 per copy as new editions are issued.

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Northeastern District: Boston, Mass., Tenth Floor, Customhouse, State Street.
Eastern District: New York, N. Y., 1278 Hudson Terminal Building, 50 Church Street.
Southeastern District: Norfolk, Va., 1001 Monticello Avenue.
Southern District: New Orleans, La., 314 Customhouse, 423 Canal St.
Caribbean District: San Juan, Puerto Rico, Post Office Box 3067, Santurce, P. R.
Southwestern District: Los Angeles, Calif., 1426 Post Office and Courthouse.
Western District: San Francisco, Calif., 114 Customhouse.
Northwestern District: Seattle, Wash., 400 Insurance Bldg.
Pacific District: Honolulu, T. H., 244 Federal Office Bldg.

CHART AGENCIES

CALIFORNIA:
- San Diego
- Newport Beach
- San Pedro
- Los Angeles
- Santa Barbara
- Monterey
- San Francisco
- Stockton
- Eureka

WASHINGTON:
- Aberdeen
- Port Angeles
- Everett
- Seattle
- Tacoma
- Olympia
- Mount Vernon
- Anacortes
- Friday Harbor
- Bellingham

OREGON:
- Marshfield
- North Bend
- Astoria
- Portland

Distance Table [1]

DISTANCES ARE GIVEN IN NAUTICAL MILES

From— \ To—	San Diego	Los Angeles	Santa Barbara	Port San Luis	Monterey	San Francisco	Eureka	Crescent City	Port Orford	Marshfield	Gardiner	Florence	Newport	Tillamook Bay	Astoria	Portland	South Bend	Aberdeen	Port Angeles	Bellingham	Anacortes	Everett	Port Townsend	Seattle	Tacoma	Olympia
CALIFORNIA:																										
San Diego		93	172	260	369	453	651	700	759	814	829	846	878	934	984	1,070	1,014	1,027	1,165	1,209	1,194	1,217	1,189	1,226	1,246	1,271
Los Angeles	93		87	175	284	368	566	615	674	729	744	761	793	849	899	985	929	942	1,080	1,124	1,109	1,132	1,104	1,141	1,161	1,186
Santa Barbara	172	87		92	201	287	483	532	591	646	661	678	710	766	816	902	846	859	999	1,043	1,025	1,051	1,023	1,050	1,070	1,105
Port San Luis	260	175	92		121	206	403	452	511	566	581	598	630	686	736	822	766	779	918	962	947	970	942	979	999	1,024
Monterey	369	284	201	121		97	293	342	401	456	471	488	520	576	626	712	656	669	809	853	838	861	833	870	890	915
San Francisco (Ferry Building)	453	368	287	206	97		232	281	340	395	410	427	459	515	565	651	595	608	749	790	775	798	760	807	827	852
Eureka, Humboldt Bay	651	566	483	403	293	232		63	124	180	195	212	244	300	350	436	380	393	531	575	560	583	555	592	612	637
Crescent City	700	615	532	452	342	281	63		67	124	139	156	188	244	294	380	324	337	475	519	504	527	499	536	556	581
OREGON:																										
Port Orford	759	674	591	511	401	340	124	67		63	78	95	127	183	233	319	263	276	413	457	442	465	437	474	494	519
Marshfield, Coos Bay	814	729	646	566	456	395	180	124	63		41	58	91	152	200	286	230	243	381	425	410	433	405	442	462	487
Gardiner, Umpqua River	829	744	661	581	471	410	195	139	78	41		37	70	127	177	263	207	220	360	404	389	412	384	421	441	466
Florence, Siuslaw River	846	761	678	598	488	427	212	156	95	58	37		44	101	152	238	182	195	335	379	364	387	359	396	416	441
Newport, Yaquina Bay	878	793	710	630	520	459	244	188	127	91	70	44		63	114	200	144	157	299	343	328	351	323	360	380	405
Tillamook Bay Entrance	934	849	766	686	576	515	300	244	183	152	127	101	63		57	143	87	100	241	285	270	293	265	302	322	347
Astoria	984	899	816	736	626	565	350	294	233	200	177	152	114	57		86	58	71	214	358	243	266	238	275	295	320
Portland	1,070	985	902	822	712	651	436	380	319	286	263	238	200	143	86		144	157	300	344	329	352	324	361	381	406
WASHINGTON:																										
South Bend	1,014	929	846	766	656	595	380	324	263	230	207	182	144	87	58	144		44	188	232	217	240	212	249	269	294
Aberdeen, Grays Harbor	1,027	942	859	779	669	608	393	337	276	243	220	195	157	100	71	157	44		179	223	208	231	203	240	260	285
Port Angeles	1,165	1,080	999	918	809	749	531	475	413	381	360	335	299	241	214	300	188	179		55	41	61	32	67	87	114
Bellingham	1,209	1,124	1,043	962	853	790	575	519	457	425	404	379	343	285	358	344	232	223	55		18	[2] 62	43	[3] 79	[3] 99	[3] 124
Anacortes	1,194	1,109	1,025	947	838	775	560	504	442	410	389	364	328	270	243	329	217	208	41	18		[2] 48	29	[3] 65	[3] 85	[3] 110
Everett	1,217	1,132	1,051	970	861	798	583	527	465	433	412	387	351	293	266	352	240	231	61	[2] 62	[2] 48		32	28	48	72
Port Townsend	1,189	1,104	1,023	942	833	760	555	499	437	405	384	359	323	265	238	324	212	203	32	43	29	32		38	58	83
Seattle	1,226	1,141	1,050	979	870	807	592	536	474	442	421	396	360	302	275	361	249	240	67	[3] 79	[3] 65	28	38		25	50
Tacoma	1,246	1,161	1,070	999	890	827	612	556	494	462	441	416	380	322	295	381	269	260	87	[3] 99	[3] 85	48	58	25		35
Olympia	1,271	1,186	1,105	1,024	915	852	637	581	519	487	466	441	405	347	320	406	294	285	114	[3] 124	[3] 110	72	83	50	35	
Cape Flattery [4]	1,102	1,017	936	855	746	683	468	412	350	318	297	272	236	178	151	237	125	116	63	107	92	115	87	124	144	169

[1] Reference "Distances between United States Ports" U. S. Coast Pilot Series, Serial No. 444

[2] Via Deception Pass.

[3] Via Admiralty Inlet.

[4] Cape Flattery to Balboa, Canal Zone, 3,908 miles.

PLANIMETRIC MAPS

Along the Pacific Coast of the United States planimetric maps are published for the following areas:

CALIFORNIA

San Diego to San Pedro
San Francisco Bay
Sacramento River—San Joaquin River

VARIATION OF THE COMPASS

The magnetic variation for 1943 and annual decrease at points mentioned are as follows:

Locality	Variation		Annual decrease
	°	′	′
Point Loma, Calif	15	06 E.	1
Point Fermin, Calif	15	34 E.	1
Point Arguello, Calif	16	15 E.	1
Point Sur, Calif	17	09 E.	1
Farallon Lighthouse, Calif	17	54 E.	1
Point Arena, Calif	18	28 E.	1
Cape Mendocino, Calif	19	15 E.	2
Point St. George, Calif	19	51 E.	2
Cape Blanco, Oreg	20	26 E.	2
Heceta Head, Oreg	21	07 E.	2
Cape Lookout, Oreg	21	57 E.	2
Cape Disappointment, Wash	22	35 E.	2
Cape Elizabeth, Wash	23	12 E.	2
Cape Flattery, Wash	23	47 E.	2
Point Wilson, Wash	23	22 E.	2
West Point (Seattle Harbor) Wash	23	01 E.	2

RANGES FOR COMPASS ADJUSTMENT

No.	Front object	Rear object	True bearing		Variation 1943		Annual change
	SAN DIEGO		°	′	°	′	′
1	South Coronado Hotel	Largest Gas Tank	37	35	15	06 E.	−01
2	Do	El Cartez Tower	23	14	15	06 E.	−01
3	West Santa Fe Tower	KFSD Radio Towers	91	12	15	06 E.	−01
4	Largest Gas Tank	El Cartez Tower	342	38	15	06 E.	−01
	LOS ANGELES						
5	Los Angeles Harbor Light	Tank at Ford Co	9	52	15	40 E.	−01
6	Do	Stack at Hammond Lumber	341	40	15	40 E.	−01
7	Do	Tank at Fish Harbor Entr	329	18	15	40 E.	−01
8	Do	E. K. Wood Lumber Co	313	53	15	40 E.	−01
9	Do	Tank on Marine Exchange	306	28	15	40 E.	−01
10	Do	Tall Stack at Ft. MacArthur	288	41	15	40 E.	−01
	SAN FRANCISCO						
11	Ferry Tower	Mt. Tamalpais, East Peak	316	34	17	52 E.	−01
12	North Power Tower	Oakland City Hall	61	44	17	52 E.	−01
13	South Power Tower	Oakland City Hall	58	09	17	52 E.	−01
14	Point Blunt Rock	Alcatraz Light	186	44	17	52 E.	−01
15	Point Blunt Light	Yellow Bluff Light	249	06	17	52 E.	−01
	SEATTLE						
16	Black Tank, Co-Op. Bldg	Water Tower, City Park	73	28	23	01 E.	−02
17	Gray Tank, Am. Can Co	Do	61	01	23	01 E.	−02
18	Gray Tank, Bell St. dock	Do	52	54	23	01 E.	−02
19	Union Depot Tower	Marine Hospital, south end (high point)	120	51	23	01 E.	−02
20	Black Tank, Co-Op Bldg	Cross, St. Marks Church	65	27	23	01 E.	−02
21	Gray Tank, Am. Can Co	Do	51	11	23	01 E.	−02
22	Gray Tank, Bell St. dock	Do	42	29	23	01 E.	−02

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ARMY ENGINEERS

The area with which this Coast Pilot is concerned lies within the South Pacific and North Pacific Divisions of the United States Engineers.

The **District offices** are:

Los Angeles, California, Rooms 527–533, 751 South Figueroa Street.
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Seattle, Washington, Room 700, 800 Third Avenue

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District Commanders:

Los Angeles, Calif., Post Office Building, Long Beach, California.
San Francisco, Calif., Room 425 Customhouse, San Francisco, California.
Seattle, Wash., Room 550 Federal Building, Seattle, Washington.

Buoy Depots:

Los Angeles, California
San Francisco, California
Tongue Point, Astoria, Oregon
Seattle, Washington

Air Stations:

San Diego, California
San Francisco, California
Port Angeles, Washington

Radio Direction Finder Stations:

Point Fermin
Point Hueneme
Point Montara
Point Reyes
Empire
Fort Stevens
Klipsan Beach
Tatoosh, Cape Flattery

Lifeboat stations Pacific coast

Official designation [1]	Name of station	State	Locality
309	Golden Gate	California	¾ mile south of Point Lobos.
310	Fort Point	do	¾ miles east of south end of Golden Gate Bridge.
311	Point Bonita	do	Bonita Point.
312	Bolinas Bay	do	Bolinas Bay.
313	Point Reyes	do	2⅜ miles east of Point Reyes Light.
314	Arena Cove	do	2½ miles southeast from Point Arena Light.
316	Humboldt Bay	do	Near old lighthouse tower, north side entrance to Humboldt Bay.
318	Port Orford	Oregon	At Nelly's Cove, Port Orford, Oreg.
319	Coquille River	do	Bandon, Oreg., south side Coquille River.
320	Coos Bay	do	South side entrance Coos Bay, about ⅜ mile east of Coos Head.
321	Umpqua River	do	North side entrance Umpqua River.
322	Siuslaw	do	Near mouth Siuslaw River.
323	Yaquina Bay	do	Water front, Yaquina Bay, Newport, Oreg.
325	Tillamook Bay	do	North side entrance, Tillamook Bay.
326	Point Adams	do	Near mouth of Columbia River, ¾ mile southeast of Fort Stevens.
327	Cape Disappointment	Washington	Fort Canby, north side entrance of Columbia River.
329	Willapa Bay	do	1¼ miles east Willapa Bay Light.
330	Grays Harbor	do	Just south of Grays Harbor Light.
331	Quillayute River	do	South side mouth of Quillayute River.
332	Baada Point	do	Neah Bay.

[1] For aviation purposes only.

CUSTOMS PORTS OF ENTRY

Those marked with * are authorized to issue marine documents.

CALIFORNIA:

San Diego*, headquarters port for San Diego and Imperial Counties
Los Angeles*, headquarters port for southern California, southward of the northern boundary of San Luis Obispo, Kern, and San Bernardino Counties except San Diego and Imperial Counties; Post Office Building, San Pedro
Long Beach, Pier 1, Berth 50, Municipal Docks
Port San Luis*, Avila
Monterey*, Customhouse (old)
San Francisco*, headquarters port of northern California northward of northern boundaries of San Luis Obispo, Kern- and San Bernardino Counties, Custom, house
Oakland*, 13th and Alice Streets
Eureka*, Federal Building

OREGON:

Marshfield*, Federal Building
Newport*, New England Fish Company Pier
Astoria*, Federal Building

OREGON—continued.

Portland*, headquarters port for all of the State of Oregon and that part of the State of Washington which embraces the waters of the Columbia River and the north bank of said river westward of 119° of west longitude

WASHINGTON:

Raymond, Port of Willapa Bay Terminal
Aberdeen*, Federal Building
Port Angeles*, Federal Building
Port Townsend*, Federal Building
Seattle*, headquarters port for all of the State of Washington, except that port which embraces the waters of the Columbia River and the north bank of said river westward of 119° of west longitude, Federal Building
Olympia*, Port Docks
Tacoma*, Federal Building, Municipal Dock, and Baker Dock
Bellingham*, Federal Building
Anacortes, Post Office
Friday Harbor, Bank Building
Orcas, on Ferry Landing
Everett, Post Office Building

IMMIGRATION AND NATURALIZATION OFFICES

San Diego, Calif., 325 W. F Street
San Pedro, Calif., berth 72 at foot of Twenty-second Street
San Francisco, Calif., 801 Silver Avenue
Oakland, Calif., 13th and Alice Streets
Eureka, Calif., Federal Building
Astoria, Oreg., Federal Building
Aberdeen, Wash., Post Office
Port Angeles, Wash., Federal Building
Tacoma, Wash., Federal Building
Anacortes, Wash., Post Office

FISH & WILDLIFE SERVICE OFFICES

Portland, Oreg., American Bank Building
Seattle, Wash., Federal Office Building

PUBLIC HEALTH SERVICE

Quarantine Stations:

San Diego, California
Los Angeles, California
San Francisco, California
Astoria, Oregon
Portland, Oregon
Port Angeles, Washington
Seattle, Washington

Additional ports at which quarantine inspection and/or the medical examination of aliens is performed:

CALIFORNIA:
Santa Barbara
CALIFORNIA—continued.
Port San Luis
Monterey
Eureka
OREGON:
Marshfield
WASHINGTON:
South Bend
Aberdeen
Anacortes
Bellingham
Blaine
Everett
Tacoma
Olympia

Marine Hospitals:

San Francisco, California, 14th Avenue and Lake Street
Out-patient office, Appraiser's Building
Seattle, Washington, Judkins Street and 14th Avenue South
Out-patient office, Federal Building

Second-Class Relief Stations:

San Diego, California, 208 New Post Office Building
Los Angeles, California, Federal Building, Los Angeles
Federal Building, San Pedro
Portland, Oregon, United States Court House

Third-Class Relief Stations:

Eureka, California, First National Bank Building
Marshfield, Oregon, Irving Block
Newport, Oregon, Hurlburt Street
Astoria, Oregon, Post Office
South Bend, Washington, Pacific State Bank Building
Aberdeen, Washington, Beckler Building
Anacortes, Washington, Empire Building
Bellingham, Washington, Bellingham National Bank Building
Everett, Washington, Medical Dental Building

Tacoma, Washington, Medical Arts Building
Olympia, Washington, Security Bank Building

Fourth-Class Relief Station: (Medical attention arranged through the Coast Guard)
Port Townsend, Washington

FEDERAL COMMUNICATIONS COMMISSION

District Offices

San Diego, Calif., Room 307 Customhouse
Los Angeles, Calif., Room 539 U. S. Customhouse and Post Office
San Francisco, Calif., Room 328 Customhouse
Portland, Oreg., Room 805 Terminal Sales Building
Seattle, Wash., Room 808 Federal Office Building

HARBOR MASTERS

The principal ports having harbor masters or port directors, and addresses through which they may be reached, are given below:

CALIFORNIA:
Balboa, Bay Front (near Pavilion)
Long Beach, Head of Pier "B"
San Pedro, Berth 88
Santa Monica, Pier
Hueneme, Transit Shed at Pier
Santa Barbara, Breakwater

CALIFORNIA—continued.
Monterey, Municipal Wharf No. 2
San Francisco, Ferry Building
Martinez, Municipal Wharf

WASHINGTON:
Tacoma, Municipal Dock
Seattle, Pier 1.

YACHT CLUBS

CALIFORNIA:
San Diego Yacht Club, San Diego
San Diego Power Boat Club, San Diego
Southwestern Yacht Club, San Diego
Coronado Yacht Club, Coronado
Balboa Yacht Club, Newport
Newport Yacht Club, Newport
California Yacht Club of Los Angeles, Los Angeles
Los Angeles Yacht Club, Los Angeles
Transpacific Yacht Club, Los Angeles
West Basin Yacht Club, Los Angeles
West Coast Yacht Club, Los Angeles
Long Beach Yacht Club, Long Beach
South Coast Corinthian Yacht Club, Santa Monica
Catalina Island Yacht Club, Avalon
Emerald Bay Yacht Club, Emerald Bay
Pacific Writers Yacht Club, Isthmus
Santa Cruz Power Boat Club, Santa Cruz
Santa Cruz Yacht Club, Santa Cruz
Santa Barbara Yacht Club, Santa Barbara
San Luis Yacht Club, San Luis Obispo

CALIFORNIA—continued.
Aeolian Yacht Club, Alameda
Berkeley Yacht Club, Berkeley
Corinthian Yacht Club of San Francisco, San Francisco
Marin Yacht Club, San Rafael
Oakland Yacht Club, Oakland
Palo Alto Yacht Club, Palo Alto
Richmond Yacht Club, Richmond
St. Francis Yacht Club, San Francisco
San Francisco Yacht Club, San Francisco
Vallejo Yacht Club, Vallejo

OREGON:
Oregon Yacht Club, Portland
Portland Yacht Club, Portland

WASHINGTON:
Seattle Yacht Club, Seattle
Queen City Yacht Club, Seattle
Everett Yacht Club, Everett
Bremerton Yacht Club, Bremerton
Tacoma Yacht Club, Tacoma
Olympia Yacht Club. Olympia

Marine Railways and Drydocks

WHERE SEVERAL MARINE RAILWAYS ARE LOCATED AT ONE PLACE, THE DIMENSIONS ARE GIVEN ONLY FOR THE LARGEST ONE.

Port	Name	Length	Draft	Capacity	Machine shop
CALIFORNIA:		*Feet*	*Feet*	*Tons*	
San Diego	Marine railway	212	15	1, 200	
Los Angeles	do	575	25	15, 000	Yes.
Long Beach	Floating drydock	310	20	3, 000	Yes.
Carmel	Marine railway	30			
San Francisco	Graving dock	1, 020	40		Yes.
Oakland	Marine railway	701	30	21, 000	Yes.
Stockton	Skidway	250	6	1, 200	Yes.
OREGON:					
North Bend	Marine railway	100	9		
Astoria	do	100	9	300	
Portland	Floating drydock	492	27	15, 000	Yes.
WASHINGTON:					
Grays Harbor	Marine railway	120	12		
Roche Harbor	do	187	20	1, 200	
Bellingham	do	108	12	300	
Port Townsend	do	80	12	75	
Everett	do	260	10	800	
Eagle Harbor	do	325	17	3, 000	Yes.
Bremerton	Graving dock	1, 200	40		Yes.
Seattle	Floating drydock	531	31	16, 000	Yes.
Houghton	Marine railway	220	16	1, 800	Yes.
Tacoma	do	150	15	800	Yes.
Gig Harbor	Graving dock	171	9		

WEATHER BUREAU

OFFICES

CALIFORNIA:

San Diego, Lindberg Field
Long Beach, Municipal Airport
Los Angeles, 106 W Sixth Street
San Francisco, 50 Fulton Street
Eureka, Federal Building

OREGON:

Marshfield, Federal Building
Portland, Customhouse

WASHINGTON:

Port Townsend, Federal Building
Tacoma, Fidelity Building
Bellingham, Herald Building
Seattle, Federal Office Building

STORM WARNING DISPLAY STATIONS

CALIFORNIA:

San Diego, Municipal Broadway Pier
San Diego, Naval Air Station
San Diego, Yacht Club*
Coronado
Point Loma
Newport Beach*
Long Beach
Los Angeles, Yacht Club
San Pedro*
Santa Barbara*
Santa Monica*
Avalon*
San Nicolas Island

*Both day and night display.

CALIFORNIA—continued.

Port San Luis
San Francisco, Pier 45
San Francisco, Telephone Bldg.*
Humboldt Bay*

OREGON:

Coquille River, Life Boat Station
Coos Bay Coast Guard Station
North Bend
Marshfield*
Newport
Columbia River, Lightship
Point Adams
Astoria*
Westport

WASHINGTON:
- North Head*
- South Bend*
- Aberdeen*
- Umatilla Reef Lightship
- Tatoosh Island*
- Swiftsure Bank Lightship
- Neah Bay*
- Port Angeles*

WASHINGTON—continued.
- Bellingham*
- Blaine*
- Port Townsend*
- Everett*
- Seattle*
- Seattle, Portage Bay Yacht Club
- Seattle, Lake Union*
- Tacoma*

Hours of operation of fog signals

Station	January	February	March	April	May	June	July	August	September	October	November	December	Total
Ballast Point, San Diego Bay	27	11	8	3	9	10	8	5	7	19	22	8	137
Point Loma	12	54	34	21	5	10	4	23	18	35	27	18	261
Los Angeles Harbor	16	49	35	37	16	13	9	47	45	63	56	38	424
Point Hueneme	10	38	22	28	19	42	35	89	60	45	31	9	428
Point Arguello	36	34	35	54	47	104	151	145	116	67	53	26	868
San Luis Obispo	33	22	33	55	48	94	162	159	146	87	50	17	906
Piedras Blancas	40	41	53	55	40	96	188	160	151	93	73	30	1,020
Point Sur	26	25	49	52	30	86	164	145	130	95	41	16	859
Ano Nuevo Island	30	39	50	33	23	52	105	92	122	116	68	37	767
Farallon	28	48	55	30	27	61	104	116	126	110	68	28	801
Bonita Point	51	51	46	29	24	59	112	108	121	118	90	49	858
Alcatraz fog signal	31	37	37	18	12	37	67	58	68	66	55	27	516
Mare Island	38	23	10	4	3	----	12	6	2	10	28	38	171
Point Reyes	68	74	65	54	63	108	189	191	175	168	97	64	1,316
Point Arena	30	49	55	30	41	82	159	168	146	125	71	30	986
Point Cabrillo	33	49	98	30	43	92	150	188	171	136	68	26	1,084
Punta Gorda	36	41	43	17	35	74	118	112	97	90	28	16	707
Blunts Reef Light Vessel	77	95	84	48	56	104	146	175	160	140	72	45	1,202
Table Bluff	26	77	72	24	32	81	158	156	161	137	60	30	1,014
Humboldt Bay	42	61	81	28	44	81	148	160	209	190	92	35	1,171
Trinidad Head	16	84	50	33	41	67	177	158	182	128	67	21	1,024
St. George Reef	26	59	64	26	47	92	178	200	160	118	53	14	1,037
Coquille River	21	50	23	26	38	59	90	122	128	103	46	17	723
Tillamook Rock	30	54	42	24	22	40	83	89	66	54	28	30	562
Columbia River Light Vessel	58	68	55	36	25	26	53	70	66	63	60	54	634
Desdemona Sands	18	17	17	9	10	7	18	17	23	23	17	10	186
Willamette River	60	32	12	1	1	----	----	----	14	40	71	61	292
Grays Harbor	69	52	57	25	25	40	83	138	92	81	82	56	800
Destruction Island	28	27	37	19	25	43	85	105	68	56	25	22	540
Umatilla Reef Light Vessel	51	47	50	36	40	35	76	148	89	73	60	41	746
Cape Flattery	52	34	34	22	40	67	105	168	100	52	27	21	722
Point Wilson	40	40	16	11	17	29	30	88	62	46	25	7	411
West Point	31	45	20	4	4	6	8	31	39	49	56	51	344
Browns Point	98	96	48	24	8	9	11	80	129	130	99	105	837

NOTE.—It should be borne in mind that the amount of fog encountered in any month may vary widely from the mean values given above. For example, in February 1925 there were 158 hours of fog in Los Angeles Harbor. At Farallon Island there were 153 hours of fog in January 1925 while the average shown in the table is 28 hours. The winter of 1925 was an exceptionally foggy one for the coasts of southern California.

Conversion Table, Points to Degrees (and vice versa)

° ′	Points	° ′	Points	° ′	Points	° ′	Points
0 00	N	45 00	NE	90 00	E	135 00	SE
0 42		45 42		90 42		135 42	
1 24	N⅛E	46 24	NE⅛E	91 24	E⅛S	136 24	SE⅛S
2 07		47 07		92 07		137 07	
2 49	N¼E	47 49	NE¼E	92 49	E¼S	137 49	SE¼S
3 31		48 31		93 31		138 31	
4 13	N⅜E	49 13	NE⅜E	94 13	E⅜S	139 13	SE⅜S
4 55		49 55		94 55		139 55	
5 38	N½E	50 38	NE½E	95 38	E½S	140 38	SE½S
6 20		51 20		96 20		141 20	
7 02	N⅝E	52 02	NE⅝E	97 02	E⅝S	142 02	SE⅝S
7 44		52 44		97 44		142 44	
8 26	N¾E	53 26	NE¾E	98 26	E¾S	143 26	SE¾S
9 08		54 08		99 08		144 08	
9 51	N⅞E	54 51	NE⅞E	99 51	E⅞S	144 51	SE⅞S
10 33		55 33		100 33		145 33	
11 15	N×E	56 15	NE×E	101 15	E×S	146 15	SE×S
11 57		56 57		101 57		146 57	
12 39	N×E⅛E	57 39	NE×E⅛E	102 39	ESE⅞E	147 39	SSE⅞E
13 22		58 22		103 22		148 22	
14 04	N×E¼E	59 04	NE×E¼E	104 04	ESE¾E	149 04	SSE¾E
14 46		59 46		104 46		149 46	
15 28	N×E⅜E	60 28	NE×E⅜E	105 28	ESE⅝E	150 28	SSE⅝E
16 10		61 10		106 10		151 10	
16 53	N×E½E	61 53	NE×E½E	106 53	ESE½E	151 53	SSE½E
17 35		62 35		107 35		152 35	
18 17	N×E⅝E	63 17	NE×E⅝E	108 17	ESE⅜E	153 17	SSE⅜E
18 59		63 59		108 59		153 59	
19 41	N×E¾E	64 41	NE×E¾E	109 41	ESE¼E	154 41	SSE¼E
20 23		65 23		110 23		155 23	
21 06	N×E⅞E	66 06	NE×E⅞E	111 06	ESE⅛E	156 06	SSE⅛E
21 48		66 48		111 48		156 48	
22 30	NNE	67 30	ENE	112 30	ESE	157 30	SSE
23 12		68 12		113 12		158 12	
23 54	NNE⅛E	68 54	ENE⅛E	113 54	SE×E⅞E	158 54	S×E⅞E
24 37		69 37		114 37		159 37	
25 19	NNE¼E	70 19	ENE¼E	115 19	SE×E¾E	160 19	S×E¾E
26 01		71 01		116 01		161 01	
26 43	NNE⅜E	71 43	ENE⅜E	116 43	SE×E⅝E	161 43	S×E⅝E
27 25		72 25		117 25		162 25	
28 08	NNE½E	73 08	ENE½E	118 08	SE×E½E	163 08	S×E½E
28 50		73 50		118 50		163 50	
29 32	NNE⅝E	74 32	ENE⅝E	119 32	SE×E⅜E	164 32	S×E⅜E
30 14		75 14		120 14		165 14	
30 56	NNE¾E	75 56	ENE¾E	120 56	SE×E¼E	165 56	S×E¼E
31 38		76 38		121 38		166 38	
32 21	NNE⅞E	77 21	ENE⅞E	122 21	SE×E⅛E	167 21	S×E⅛E
33 03		78 03		123 03		168 03	
33 45	NE×N	78 45	E×N	123 45	SE×E	168 45	S×E
34 27		79 27		124 27		169 27	
35 09	NE⅞N	80 09	E⅞N	125 09	SE⅞E	170 09	S⅞E
35 52		80 52		125 52		170 52	
36 34	NE¾N	81 34	E¾N	126 34	SE¾E	171 34	S¾E
37 16		82 16		127 16		172 16	
37 58	NE⅝N	82 58	E⅝N	127 58	SE⅝E	172 58	S⅝E
38 40		83 40		128 40		173 40	
39 23	NE½N	84 23	E½N	129 23	SE½E	174 23	S½E
40 05		85 05		130 05		175 05	
40 47	NE⅜N	85 47	E⅜N	130 47	SE⅜E	175 47	S⅜E
41 29		86 29		131 29		176 29	
42 11	NE¼N	87 11	E¼N	132 11	SE¼E	177 11	S¼E
42 53		87 53		132 53		177 53	
43 36	NE⅛N	88 36	E⅛N	133 36	SE⅛E	178 36	S⅛E
44 18		89 18		134 18		179 18	

Conversion Table, Points to Degrees (and vice versa)—Continued

° ′	Points	° ′	Points	° ′	Points	° ′	Point
180 00	S	225 00	SW	270 00	W	315 00	NW
180 42		225 42		270 42		315 42	
181 24	S⅛W	226 24	SW⅛W	271 24	W⅛N	316 24	NW⅛N
182 07		227 07		272 07		317 07	
182 49	S¼W	227 49	SW¼W	272 49	W¼N	317 49	NW¼N
183 31		228 31		273 31		318 31	
184 13	S⅜W	229 13	SW⅜W	274 13	W⅜N	319 13	NW⅜N
184 55		229 55		274 55		319 55	
185 38	S½W	230 38	SW½W	275 38	W½N	320 38	NW½N
186 20		231 20		276 20		321 20	
187 02	S⅝W	232 02	SW⅝W	277 02	W⅝N	322 02	NW⅝N
187 44		232 44		277 44		322 44	
188 26	S¾W	233 26	SW¾W	278 26	W¾N	323 26	NW¾N
189 08		234 08		279 08		324 08	
189 51	S⅞W	234 51	SW⅞W	279 51	W⅞N	324 51	NW⅞N
190 33		235 33		280 33		325 33	
191 15	S×W	236 15	SW×W	281 15	W×N	326 15	NW×N
191 57		236 57		281 57		326 57	
192 39	S×W⅛W	237 39	SW×W⅛W	282 39	WNW⅞W	327 39	NNW⅞W
193 22		238 22		283 22		328 22	
194 04	S×W¼W	239 04	SW×W¼W	284 04	WNW¾W	329 04	NNW¾W
194 46		239 46		284 46		329 46	
195 28	S×W⅜W	240 28	SW×W⅜W	285 28	WNW⅝W	330 28	NNW⅝W
196 10		241 10		286 10		331 10	
196 53	S×W½W	241 53	SW×W½W	286 53	WNW½W	331 53	NNW½W
197 35		242 35		287 35		332 35	
198 17	S×W⅝W	243 17	SW×W⅝W	288 17	WNW⅜W	333 17	NNW⅜W
198 59		243 59		288 59		333 59	
199 41	S×W¾W	244 41	SW×W¾W	289 41	WNW¼W	334 41	NNW¼W
200 23		245 23		290 23		335 23	
201 06	S×W⅞W	246 06	SW×W⅞W	291 06	WNW⅛W	336 06	NNW⅛W
201 48		246 48		291 48		336 48	
202 30	SSW	247 30	WSW	292 30	WNW	337 30	NNW
203 12		248 12		293 12		338 12	
203 54	SSW⅛W	248 54	WSW⅛W	293 54	NW×W⅞W	338 54	N×W⅞W
204 37		249 37		294 37		339 37	
205 19	SSW¼W	250 19	WSW¼W	295 19	NW×W¾W	340 19	N×W¾W
206 01		251 01		296 01		341 01	
206 43	SSW⅜W	251 43	WSW⅜W	296 43	NW×W⅝W	341 43	N×W⅝W
207 25		252 25		297 25		342 25	
208 08	SSW½W	253 08	WSW½W	298 08	NW×W½W	343 08	N×W½W
208 50		253 50		298 50		343 50	
209 32	SSW⅝W	254 32	WSW⅝W	299 32	NW×W⅜W	344 32	N×W⅜W
210 14		255 14		300 14		345 14	
210 56	SSW¾W	255 56	WSW¾W	300 56	NW×W¼W	345 56	N×W¼W
211 38		256 38		301 38		346 38	
212 21	SSW⅞W	257 21	WSW⅞W	302 21	NW×W⅛W	347 21	N×W⅛W
213 03		258 03		303 03		348 03	
213 45	SW×S	258 45	W×S	303 45	NW×W	348 45	N×W
214 27		259 27		304 27		349 27	
215 09	SW⅞S	260 09	W⅞S	305 09	NW⅞W	350 09	N⅞W
215 52		260 52		305 52		350 52	
216 34	SW¾S	261 34	W¾S	306 34	NW¾W	351 34	N¾W
217 16		262 16		307 16		352 16	
217 58	SW⅝S	262 58	W⅝S	307 58	NW⅝W	352 58	N⅝W
218 40		263 40		308 40		353 40	
219 23	SW½S	264 23	W½S	309 23	NW½W	354 23	N½W
220 05		265 05		310 05		355 05	
220 47	SW⅜S	265 47	W⅜S	310 47	NW⅜W	355 47	N⅜W
221 29		266 29		311 29		356 29	
222 11	SW¼S	267 11	W¼S	312 11	NW¼W	357 11	N¼W
222 53		267 53		312 53		357 53	
223 36	SW⅛S	268 36	W⅛S	313 36	NW⅛W	358 36	N⅛W
224 18		269 18		314 18		359 18	

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Conversion Tables, Feet and Fathoms to Meters, and Vice Versa

FEET TO METERS

Feet	0	1	2	3	4	5	6	7	8	9
0	0. 00	0. 30	0. 61	0. 91	1. 22	1. 52	1. 83	2. 13	2. 44	2. 74
10	3. 05	3. 35	3. 66	3. 96	4. 27	4. 57	4. 88	5. 18	5. 49	5. 79
20	6. 10	6. 40	6. 71	7. 01	7. 32	7. 62	7. 92	8. 23	8. 53	8. 84
30	9. 14	9. 45	9. 75	10. 06	10. 36	10. 67	10. 97	11. 28	11. 58	11. 89
40	12. 19	12. 50	12. 80	13. 11	13. 41	13. 72	14. 02	14. 33	14. 63	14. 93
50	15. 24	15. 54	15. 85	16. 15	16. 46	16. 76	17. 07	17. 37	17. 68	17. 98
60	18. 29	18. 59	18. 90	19. 20	19. 51	19. 81	20. 12	20. 42	20. 73	21. 03
70	21. 34	21. 64	21. 95	22. 25	22. 55	22. 86	23. 16	23. 47	23. 77	24. 08
80	24. 38	24. 69	24. 99	25. 30	25. 60	25. 91	26. 21	26. 52	26. 82	27. 13
90	27. 43	27. 74	28. 04	28. 35	28. 65	28. 96	29. 26	29. 57	29. 87	30. 17

FATHOMS TO METERS

Fathoms	0	1	2	3	4	5	6	7	8	9
0	0. 00	1. 83	3. 66	5. 49	7. 32	9. 14	10. 97	12. 80	14. 63	16. 46
10	18. 29	20. 12	21. 95	23. 77	25. 60	27. 43	29. 26	31. 09	32. 92	34. 75
20	36. 58	38. 40	40. 23	42. 06	43. 89	45. 72	47. 55	49. 38	51. 21	53. 03
30	54. 86	56. 69	58. 52	60. 35	62. 18	64. 01	65. 84	67. 67	69. 49	71. 32
40	73. 15	74. 98	76. 81	78. 64	80. 47	82. 30	84. 12	85. 95	87. 78	89. 61
50	91. 44	93. 27	95. 10	96. 93	98. 75	100. 58	102. 41	104. 24	106. 07	107. 90
60	109. 73	111. 56	113. 39	115. 21	117. 04	118. 87	120. 70	122. 53	124. 36	126. 19
70	128. 02	129. 85	131. 67	133. 50	135. 33	137. 16	138. 99	140. 82	142. 65	144. 47
80	146. 30	148. 13	149. 96	151. 79	153. 62	155. 45	157. 28	159. 11	160. 93	162. 76
90	164. 59	166. 42	168. 25	170. 08	171. 91	173. 74	175. 56	177. 39	179. 22	181. 05

METERS TO FEET

Meters	0	1	2	3	4	5	6	7	8	9
0	0. 00	3. 28	6. 56	9. 84	13. 12	16. 40	19. 68	22. 97	26. 25	29. 53
10	32. 81	36. 09	39. 37	42. 65	45. 93	49. 21	52. 49	55. 77	59. 06	62. 34
20	65. 62	68. 90	72. 18	75. 46	78. 74	82. 02	85. 30	88. 58	91. 86	95. 14
30	98. 42	101. 71	104. 99	108. 27	111. 55	114. 83	118. 11	121. 39	124. 67	127. 95
40	131. 23	134. 51	137. 80	141. 08	144. 36	147. 64	150. 92	154. 20	157. 48	160. 76
50	164. 04	167. 32	170. 60	173. 88	177. 16	180. 45	183. 73	187. 01	190. 29	193. 57
60	196. 85	200. 13	203. 41	206. 69	209. 97	213. 25	216. 54	219. 82	223. 10	226. 38
70	229. 66	232. 94	236. 22	239. 50	242. 78	246. 06	249. 34	252. 62	255. 90	259. 19
80	262. 47	265. 75	269. 03	272. 31	275. 59	278. 87	282. 15	285. 43	288. 71	291. 99
90	295. 28	298. 56	301. 84	305. 12	308. 40	311. 68	314. 96	318. 24	321. 52	324. 80

METERS TO FATHOMS

Meters	0	1	2	3	4	5	6	7	8	9
0	0. 00	0. 55	1. 09	1. 64	2. 19	2. 73	3. 28	3. 83	4. 37	4. 92
10	5. 47	6. 01	6. 56	7. 11	7. 66	8. 20	8. 75	9. 30	9. 84	10. 39
20	10. 94	11. 48	12. 03	12. 58	13. 12	13. 67	14. 22	14. 76	15. 31	15. 86
30	16. 40	16. 95	17. 50	18. 04	18. 59	19. 14	19. 68	20. 23	20. 78	21. 33
40	21. 87	22. 42	22. 97	23. 51	24. 06	24. 61	25. 15	25. 70	26. 25	26. 79
50	27. 34	27. 89	28. 43	28. 98	29. 53	30. 07	30. 62	31. 17	31. 71	32. 26
60	32. 81	33. 36	33. 90	34. 45	35. 00	35. 54	36. 09	36. 64	37. 18	37. 73
70	38. 28	38. 82	39. 37	39. 92	40. 46	41. 01	41. 56	42. 10	42. 65	43. 20
80	43. 74	44. 29	44. 84	45. 38	45. 93	46. 48	47. 03	47. 57	48. 12	48. 67
90	49. 21	49. 76	50. 31	50. 85	51. 40	51. 95	52. 49	53. 04	53. 59	54. 13

Meteorological Table, San Diego, Calif.

COMPILED BY THE UNITED STATES WEATHER BUREAU

Month	Barometer at 32° F. and mean sea level				Air temperature, in degrees F.							Average relative humidity	Average amount of clouds, 0–10	Precipitation			Wind										Days with 32 miles or over	Number of days dense fog
	Mean	Extremes			Mean				Extremes								Statute miles		Average number of times (observations at 8 a. m. and 8 p. m.) from—										
	For month	Highest	Lowest	Range	For month	Mean max.	Mean min.	Range	Highest	Lowest	Range			Average fall	Number of days 0.01 in. or over	Maximum fall in 24 hours	Average hourly velocity	Highest velocity	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm		
	Ins.	*Ins.*	*Ins.*	*Ins.*	°	°	°	°	°	°	°	%		*Ins.*		*Ins.*		(1)										
January	30.07	30.48	29.48	1.00	54.3	62.6	46.7	15.9	85	25	60	66	4	2.06	7	2.49	6	43	8	12	7	2	5	3	5	20	0	(1)	2
February	30.06	30.53	29.49	1.05	55.1	63.0	48.1	14.9	89	34	55	71	5	2.03	7	2.90	7	36	4	11	7	3	4	5	7	15	0	(1)	2
March	30.02	30.45	29.46	.99	56.7	64.1	50.1	14.0	99	36	63	70	4	1.72	7	2.40	7	37	4	9	8	4	4	5	10	18	0	(1)	1
April	29.99	30.36	29.61	.75	58.5	65.5	52.8	12.7	96	39	57	73	4	.77	4	3.23	7	37	5	8	6	2	4	7	12	16	0	(1)	1
May	29.95	30.26	29.67	.59	60.8	66.6	56.0	10.6	98	45	53	75	5	.35	3	1.45	7	33	4	4	5	2	4	11	17	15	0	0	1
June	29.92	30.12	29.66	.46	63.9	69.3	59.0	10.3	96	50	46	77	4	.05	1	.25	7	25	6	3	2	3	6	13	12	15	0	0	1
July	29.92	30.12	29.66	.46	67.2	72.6	62.5	10.1	100	54	46	78	4	.03	1	.83	7	28	7	3	1	2	3	12	14	19	1	0	1
August	29.89	30.16	29.64	.52	68.7	74.1	63.9	10.2	94	54	40	78	3	.04	1	1.80	7	26	8	5	1	1	3	10	13	20	1	0	1
September	29.89	30.14	29.52	.62	67.1	73.2	61.6	11.6	110	50	60	76	3	.08	1	1.50	7	34	8	6	4	1	3	5	8	24	1	0	2
October	29.95	30.24	29.57	.67	63.7	70.7	56.9	13.8	96	44	52	72	3	.54	3	3.24	7	27	6	9	5	3	4	6	7	22	0	0	4
November	30.02	30.39	29.52	.87	59.7	68.6	51.8	16.8	93	36	57	64	3	.76	3	2.75	6	28	6	14	8	2	3	4	4	19	0	0	2
December	30.07	30.45	29.51	.94	56.0	64.7	48.5	16.2	84	32	52	64	4	1.87	6	3.62	6	34	7	16	7	3	2	3	4	20	0	(1)	1
Mean	29.98				61.0	67.9	54.8	13.1				72	4				7												
Total														10.30	44				73	100	61	28	45	84	113	223	3	(1)	19

Meteorological Table, San Francisco, Calif.

COMPILED BY THE UNITED STATES WEATHER BUREAU

January	30.11	30.62	28.85	1.77	50.1	55.1	44.9	10.2	78	29	49	75	5	4.78	12	4.67	8	45	9	6	3	6	10	7	9	11	1	1	2
February	30.09	30.62	29.13	1.49	52.7	58.5	47.0	11.5	80	33	47	73	5	3.81	11	3.60	8	41	6	5	2	4	8	5	16	10	0	(1)	2
March	30.06	30.64	29.24	1.40	54.4	60.7	48.3	12.4	86	33	53	70	5	3.10	10	3.67	9	47	5	4	1	5	6	8	22	11	0	(1)	1
April	30.05	30.48	29.43	1.05	55.7	62.2	49.4	12.8	89	40	49	70	4	1.53	6	2.43	10	38	3	1	1	1	5	9	33	7	0	(1)	(1)
May	29.99	30.35	29.63	.72	57.1	63.4	50.7	12.7	97	42	55	72	5	.68	4	1.42	11	36	1	0	0	1	4	12	38	5	1	(1)	(1)
June	29.96	30.38	29.62	.76	58.9	65.6	52.2	13.4	100	46	54	74	4	.15	2	1.23	11	38	0	0	0	0	2	14	38	5	1	(1)	1
July	29.95	30.28	29.65	.63	58.9	65.1	52.9	12.2	99	47	52	78	4	.01	(1)	.23	12	34	0	0	0	0	1	19	41	1	0	(1)	1
August	29.95	30.29	29.60	.69	59.4	65.3	53.4	11.9	92	46	46	80	4	.02	(1)	.25	11	34	0	0	0	0	1	20	40	1	0	(1)	1
September	29.95	30.26	29.50	.76	61.5	68.5	54.7	13.8	101	47	54	73	4	.30	2	3.58	9	37	1	0	1	1	2	12	37	4	2	(1)	1
October	30.01	30.39	29.56	.83	60.7	67.8	53.7	14.1	96	43	53	70	4	.96	4	2.03	8	35	4	2	1	1	6	8	32	7	1	(1)	2
November	30.10	30.51	29.44	1.07	56.8	62.9	50.7	12.2	83	38	45	69	4	2.40	7	3.98	7	50	7	5	1	3	5	7	18	13	1	(1)	3
December	30.12	30.61	29.33	1.28	51.4	51.4	46.5	9.9	74	27	47	74	5	4.40	10	3.44	7	50	9	10	3	6	8	4	10	12	0	(1)	2
Mean	30.03				56.5	62.6	50.4	12.2				73	4				9												
Total														22.14	68				45	33	13	28	58	125	334	87	7	1	16

[1] Less than 1.

Meteorological Table, Eureka, Calif.

COMPILED BY THE UNITED STATES WEATHER BUREAU

Month	Barometer at 32° F. and mean sea level				Air temperature, in degrees F.							Average relative humidity	Average amount of clouds, 0–10	Precipitation			Wind										Days with 32 miles or over	Number of days dense fog
	Mean	Extremes			Mean				Extremes					Average fall	Number of days 0.01 in. or over	Maximum fall in 24 hours	Statute miles		Average number of times (observations at 8 a. m. and 8 p. m.) from—									
	For month	Highest	Lowest	Range	For month	Mean max.	Mean min.	Range	Highest	Lowest	Range						Average hourly velocity	Highest velocity	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm		
	Ins.	*Ins.*	*Ins.*	*Ins.*	°	°	°	°	°	°	°.	%		*Ins.*		*Ins.*		(1)										
January	30.13	30.66	29.11	1.55	47.7	53.2	41.2	12.0	77	20	57	82	7	6.85	17	5.10	7	46	8	3	4	19	13	8	3	3	1	1	4
February	30.12	30.65	28.93	1.72	47.8	53.8	41.7	12.1	85	24	61	81	7	6.12	15	4.91	8	40	11	4	4	13	8	8	4	4	0	(1)	3
March	30.12	30.55	29.05	1.50	48.6	54.5	42.8	11.7	78	29	49	80	6	5.26	16	3.94	8	38	14	3	4	15	7	6	6	7	0	1	2
April	30.11	30.56	29.29	1.27	50.2	55.7	44.8	10.9	79	31	48	81	6	3.26	12	2.87	9	46	17	3	2	9	6	7	5	11	0	(1)	1
May	30.09	30.49	29.38	1.11	52.4	57.2	47.7	9.5	84	35	49	82	6	1.73	9	2.24	9	37	17	3	2	7	7	9	5	12	0	(1)	1
June	30.07	30.37	29.65	.72	54.8	59.4	50.1	9.3	85	40	45	83	6	.73	5	1.99	8	38	18	2	1	5	4	7	6	16	1	(1)	2
July	30.07	30.30	29.68	.62	55.8	60.0	51.7	8.3	76	43	33	85	6	.10	2	1.18	7	38	15	2	1	2	6	9	7	19	1	(1)	4
August	30.05	30.26	29.72	.54	56.4	60.6	52.1	8.5	79	44	35	85	6	.14	2	2.63	6	32	15	2	1	4	7	7	8	17	1	(1)	6
September	30.02	30.30	29.56	.74	55.8	61.1	50.5	10.6	85	36	49	84	6	.91	5	2.77	6	37	14	2	3	7	6	8	8	11	1	(1)	8
October	30.08	30.46	29.40	1.06	53.8	59.6	47.9	11.7	84	34	50	83	6	2.34	9	3.61	6	34	13	4	3	12	5	9	7	8	1	(1)	9
November	30.14	30.57	29.33	1.24	51.0	57.4	44.7	12.7	81	27	54	82	7	4.84	12	4.55	6	36	11	4	5	14	9	9	4	3	1	(1)	7
December	30.14	30.71	29.11	1.60	48.1	54.4	41.8	12.6	70	22	48	82	6	6.44	16	4.17	7	40	10	4	6	19	9	7	4	3	0	1	4
Mean	30.09				51.8	57.2	46.4	10.8				82	6				7												
Total														38.70	120				163	36	36	126	87	94	67	114	7	3	51

Meteorological Table, North Head, Wash.

COMPILED BY THE UNITED STATES WEATHER BUREAU

January	30.05	30.70	28.72	1.98	42.1	46.0	38.2	7.8	67	11	56	86	8	8.78	22	4.29	17	95	3	3	21	13	8	4	5	5	0	15	2
February	30.04	30.79	29.01	1.78	43.0	47.3	38.7	8.6	71	14	57	84	7	7.45	19	3.69	15	70	4	2	16	11	6	5	4	8	0	12	2
March	30.04	30.62	28.78	1.84	45.2	49.6	40.8	8.8	79	22	57	84	7	5.56	18	2.98	15	73	5	2	10	12	8	5	5	15	0	13	2
April	30.08	30.69	29.24	1.45	47.5	51.9	43.1	8.8	88	33	55	83	7	4.14	17	2.74	15	65	5	1	6	7	8	5	6	22	0	12	2
May	30.07	30.62	29.26	1.36	50.9	55.0	46.8	8.2	86	35	51	84	7	2.95	15	1.52	15	65	5	0	4	6	9	5	4	29	0	8	2
June	30.07	30.54	29.29	1.25	54.8	58.6	51.0	7.6	97	44	53	86	7	2.28	13	2.00	14	59	4	1	2	5	5	5	6	32	0	8	2
July	30.10	30.43	29.65	.78	57.2	60.9	53.4	7.5	97	46	51	87	6	.96	8	.92	14	50	6	0	1	3	6	3	4	39	0	6	4
August	30.07	30.36	29.49	.87	57.6	61.5	53.7	7.8	94	46	48	89	6	1.05	8	1.78	13	57	8	1	1	5	7	2	3	35	0	3	8
September	30.03	30.50	29.20	1.30	56.5	60.8	52.2	8.6	93	42	51	87	6	2.99	12	2.89	12	70	9	1	4	14	7	3	3	19	0	6	6
October	30.05	30.62	28.98	1.64	52.9	57.2	48.6	8.6	87	27	60	86	7	5.01	16	2.45	14	87	6	2	9	18	7	3	3	14	0	10	6
November	30.05	30.74	28.95	1.79	48.2	52.2	44.2	8.0	72	20	52	85	8	8.45	20	3.27	16	72	4	2	14	15	11	4	3	7	0	13	2
December	30.04	30.76	28.75	2.01	44.1	47.9	40.3	7.6	63	16	47	86	8	9.48	22	3.59	17	84	3	3	24	11	7	4	4	6	0	15	2
Mean	30.06				50.0	54.1	45.9	8.2				86	7				15												
Total														59.10	190				62	18	112	120	89	48	50	231	0	121	40

Meteorological Table, Tatoosh Island, Washington

COMPILED BY THE UNITED STATES WEATHER BUREAU

January	29.98	30.71	28.61	2.10	41.2	44.3	38.0	6.3	64	7	57	86	8	11.83	22	4.56	21	81	1	5	25	8	11	5	5	2	0	19	1
February	30.00	30.64	28.93	1.71	42.2	45.5	38.8	6.7	64	13	51	85	7	9.45	19	4.57	19	69	1	7	21	6	8	6	5	2	0	15	1
March	29.99	30.58	28.75	1.83	43.8	47.7	40.0	7.7	69	24	45	84	7	7.85	20	4.76	16	68	2	10	13	5	12	8	8	4	0	14	1
April	30.04	30.57	29.21	1.36	46.7	50.8	42.6	8.2	75	33	42	84	7	5.63	17	3.77	14	59	1	6	10	4	11	10	14	4	0	10	1
May	30.04	30.60	29.15	1.45	50.0	54.1	46.0	8.1	81	35	46	86	7	4.00	15	2.22	12	56	1	5	6	3	13	13	18	3	0	5	3
June	30.05	30.52	29.35	1.17	53.2	57.1	49.4	7.7	84	43	41	89	7	3.20	13	2.55	11	52	1	3	4	3	14	19	14	2	0	3	4
July	30.08	30.47	29.57	.90	55.3	59.3	51.3	8.0	88	44	44	91	6	1.54	9	2.35	10	46	1	3	3	1	18	23	11	2	0	2	8
August	30.05	30.41	29.54	.87	55.5	59.6	51.4	8.2	80	43	37	94	6	2.02	9	2.78	10	42	1	4	4	3	21	20	7	2	0	2	12
September	30.01	30.50	29.20	1.30	54.0	58.1	49.8	8.3	76	40	36	91	6	4.68	12	3.40	12	62	1	10	8	4	19	10	7	1	0	6	8
October	30.03	30.65	28.97	1.68	51.0	54.6	47.4	7.2	77	33	44	90	7	8.13	17	5.91	16	60	1	14	15	7	13	4	6	2	0	12	5
November	29.99	30.74	28.95	1.79	46.7	50.0	43.4	6.6	68	25	43	89	7	11.93	22	4.49	19	68	1	9	16	7	13	6	6	2	0	17	1
December	29.98	30.79	28.86	2.13	44.4	47.6	41.3	6.3	60	19	41	88	8	13.36	24	4.28	21	78	1	6	25	8	9	5	6	2	0	19	1
Mean	30.02				48.7	52.4	45.0	7.4				88	7				16												
Total														83.62	199				13	82	150	59	162	129	107	28	0	124	46

Meteorological Table, Seattle, Washington

COMPILED BY THE UNITED STATES WEATHER BUREAU

January	30.04	30.75	28.80	1.95	40.4	44.7	36.0	8.7	67	3	64	82	8	4.94	19	2.47	10	46	10	6	8	16	15	4	1	2	0	4	2
February	30.05	30.75	29.17	1.58	42.1	47.5	36.8	10.7	70	4	66	79	7	3.89	16	1.99	9	45	9	5	8	11	11	5	2	5	0	3	3
March	30.04	30.59	29.23	1.36	45.6	52.0	39.2	12.8	81	20	61	75	7	3.05	16	2.92	10	48	11	7	7	10	10	8	3	6	0	2	2
April	30.06	30.63	29.24	1.39	50.3	58.0	42.5	15.5	85	30	55	72	6	2.38	13	1.74	9	49	8	5	5	10	9	9	5	8	1	1	1
May	30.05	30.54	29.30	1.24	55.4	63.5	47.3	16.2	92	36	56	71	6	1.87	12	1.30	9	41	10	5	4	10	13	7	6	6	1	1	(1)
June	30.05	30.48	29.43	1.05	60.1	68.4	51.8	16.6	98	40	58	69	6	1.33	9	1.42	8	47	9	7	3	8	12	7	6	7	1	(1)	(1)
July	30.07	30.43	29.57	.86	64.2	73.4	54.9	18.5	100	46	54	68	4	.63	4	1.00	8	38	13	8	2	6	8	5	7	12	1	(1)	(1)
August	30.05	30.44	29.52	.92	64.0	73.0	55.1	17.9	92	46	46	71	5	.70	5	1.43	7	34	11	7	2	7	9	6	7	11	2	(1)	2
September	30.03	30.51	29.27	1.24	59.2	66.7	51.7	15.0	92	36	56	75	6	1.77	9	1.64	8	41	12	6	4	10	11	5	5	6	1	1	4
October	30.07	30.69	29.07	1.62	52.8	58.7	46.9	11.8	82	29	53	82	7	2.84	13	2.22	8	59	14	5	5	14	11	5	3	5	0	1	6
November	30.07	30.76	29.01	1.75	46.2	51.0	41.4	9.6	68	15	53	84	8	5.03	17	3.20	9	50	7	6	7	15	15	7	1	2	0	2	4
December	30.06	30.83	28.91	1.92	42.3	46.5	38.0	8.5	65	12	53	84	8	5.60	19	3.52	11	53	7	6	10	19	12	5	1	2	0	5	3
Mean	30.05				51.9	58.6	45.1	13.5				76	7				9												
Total														34.03	152				121	73	65	136	136	73	47	72	7	20	27

[1] Less than 1.

INDEX

Number in parentheses immediately following any item in this Index is number of the largest scale U. S. Coast and Geodetic chart on which that feature appears.

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